The Dock and Harbour Authority

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CONTENTS

EDITORIAL	151	CORRESPONDENCE	168
THE PORT OF LUANDA	153	NATIONAL DOCK LABOUR CORPORATION	169
DOCK LABOUR	159	THE CORINTH CANAL	170
NOTES OF THE MONTH	160	A NOTABLE FLOATING CRANE	170
THE HUMBER PORTS IN WAR-TIME	161	TWO NEW QUAYS AT TYNE DOCK, SOUTH SHIELDS	171
DUNDEE HARBOUR DEVELOPMENT	164	PUBLICATIONS RECEIVED	173
DOCK WORKERS BILL	165	CANADIAN HARBOURS IN 1944	174
THE SHIPMENT OF HEAVY CARGOES	167		

Editorial Comments

Luanda

To the average Englishman, the " man in the street," as he is often superciliously designated, the Portuguese Colony of Angola, in West Africa, is more or less *terra incognita*. Lying mainly South of the great River Congo, it is a territory which in the old days of mapping would have been portrayed in an atlas by " elephants in place of towns." Certainly it is not over-populated and the interior of the country consists largely of broad savannahs, intersected by well-wooded river valleys. The coast is undoubtedly dry and arid, but there is also an elevated mountainous region which possesses great fertility.

Luanda, or in full, St. Paul de Luanda, the subject of this month's leading article, gives its name (often spelt Loanda) both to the port described by Professor Perestrelo and to the district, or province, in which it lies. It is one of four leading ports established on the coastline and is, moreover, the capital of the whole colony. It has not quite the present importance of the neighbouring port of Lobito in regard to harbourage and general trade equipment, but, as pointed out in the article, it possesses undoubted potentialities which are now being developed with a full realisation of the benefits which can be derived from the exploitation of its position as the main terminus of the railway line in the province of Luanda.

Angola was discovered by the Portuguese navigator, Diego Cam, in 1484, and since that time has remained a Portuguese possession, undisputed except for a period of eight years (1640-1648), during which the Dutch made attempts to capture the territory with its valuable products, notably the sugar cane, the cotton tree, and coffee and tobacco plants. Wax, indiarubber and ivory are also prominent exports.

As relating to a district in a little known part of the world, the article on the proposed development of the Port of Luanda cannot fail to interest our readers and they will agree with the opinion of Professor Perestrelo that the coming years hold a great future for Angola in the new world of (it is hoped) peaceful expansion and enterprise.

The Great Dock Strike.

The past month has been remarkable for a strike of British dock workers of magnitude unprecedented in recent years. Originating in a demand put forward to Port Employers by the men's Unions on September 27th for greatly increased pay and a number of other concessions, the matter blazed up suddenly into unexpected prominence in the early part of October by reason of a relatively insignificant incident at the Birkenhead Docks on Merseyside, where the men objected to handling a consignment of pit props at normal rates of pay. Without allowing time for investigation into their complaint through the ordinary official channels, the men impatiently took the drastic step of refusing to handle any cargo at all. Discontent spread with lightning rapidity so that in a few days' time, the strike had become general at a number of ports throughout the country and the extravagant demands of the Unions (which are set out in a memorandum by the employers to be found in a later page of this issue) were adopted as an irreducible minimum for the settlement of the dispute.

In the course of the agitation, about 40,000 men have become idle and some 70 or more ships, many of them laden with perishable food supplies, have been held up in harbour waters. In Parliament, the action of the men was condemned in a firm declaration by Mr. G. Isaacs, the Minister of Labour. " I deplore the strike," he said: " it is wrong. Whatever the men's grievances, they cannot justify the strike." He refused to intervene in the dispute since by so doing, he would impair the constitutional machinery of the industry. Ultimately, the situation regarding national food supplies became so acute that the military had to be called in to unload cargoes of foodstuffs and perishable produce.

There can be no doubt as to the correctness of the attitude of the Minister of Labour. For any group of malcontents to be allowed to take the law into their own hands and hold the community to ransom is an intolerable situation. " That way madness lies." Unfortunately, there is a large body of ignorant and misinformed labour in this country which is irresponsible and careless of consequences so long as their demands for " less work and more pay " are conceded. And the more they get the more they want! Unless the saner elements of public opinion can exercise some restraint on these hot-heads, the outlook for the country in its grave economical condition after six years of war, is dark indeed.

The wild and extravagant language used by the leaders of the strike movement is certainly not conducive to a calm and reasonable settlement. At Liverpool, one of them is reported to have said: " The dockers want to live, not exist. Before I will offer to go back to the slavery and bondage offered us by the employers, I will starve in hell." Such childish nonsense would be merely

Editorial Comments—continued

laughable, were it not so mischievously provocative and inflammatory.

At the moment of going to press there is still no sign of a resumption of work at the docks and the country has to continue to suffer in consequence, especially its vital export trade.

Ship Loading

The announcement that owners of ships requisitioned for war purposes by the Government have been notified that the deeper loading of their vessels, made permissible by Defence Regulation 47 BA (S R and D, 1941, No. 1161), due to war-time conditions, is now to cease, will be hailed as a definite step in the direction of a reversion to peace-time standards of safety and security for shipping. The Regulation in question has not finally been revoked and probably some time will elapse before it and corollary orders can be officially cancelled. During the war a certain degree of risk was inevitable and, indeed, shipping accommodation has been taxed to the limit of capacity. Even now the demand for cargo and passenger space is far greater than can be met by the tonnage at disposal, but there is no longer justification for incurring risks incidental to overloading. It is time, therefore, that shipping concerns should revert to the loadlines prescribed by the International Convention of 1939 in conjunction with the Merchant Shipping (Safety and Loadline Convention) Act of 1932.

The subject of ship loading is of special importance to those port authorities who undertake and are responsible for stevedoring operations at the ports they control. It is to be feared, however, that, generally speaking, stevedoring on scientific lines has not received the degree of attention which it deserves. Much depends, not only from a safety point of view but also from an economical standpoint, on the skilful arrangement of cargo in a ship's hold, and, in the majority of cases, by reason of the irregularities in form and bulk of the consignment, there is ample scope for the exercise of no little ingenuity and skill in adapting them to the limits of a ship's capacity.

It is for this reason that we are reproducing in the present issue an article on the stowage of cargo, which appeared recently in our contemporary, the *Journal of Commerce*. The emphasis laid therein on the careful preliminary planning of the space at disposal, even to the extent of using scale models of the consignments to be expected, is well worthy of attentive consideration. It is true that, in the article in question, the cargo catered for was of a special character and the pieces largely duplicated, but the remarks made in connection therewith are of general application—that is to say, to small parcels as well as to those of large size.

The difficulty of dealing with what is termed general cargo lies in its heterogeneity. Packages of all shapes and sizes have to be dealt with and housed in confined spaces of very limited dimensions. We have often felt, and, indeed, have expressed the opinion in these columns that in many cases the use of containers capable of holding a considerable number of the smaller packages would be a convenience in stowage operations. Containers are common enough in rail and road transport: why should they not be found equally useful for sea and inland water transport?

Containers of fairly large size, but, of course, within the lifting capacity of quay cranes or the ship's derricks, would reduce the number and frequency of lifts as also the necessity for awkwardly packed slings, which are attended by the risk of accident due to the fall of dislodged articles which may cause injuries, more or less serious to workers at the hatches.

It cannot be contended that containers would solve all the problems of stevedoring, nor are they suitable in all cases, but the system should certainly be applicable to no inconsiderable part of general cargo shipments, and the possibility of a more general adoption is worthy of exploration.

Dock Labour Regularisation

A definite step to decasualise dock labour and put it on a permanent basis has been taken by the Government in the presentation to Parliament, on October 11th, of a Bill entitled "Dock Workers (Regulation of Employment) Bill." The object of the measure is to enable permanent arrangements to be made for the "greater regularity of employment for dock workers and for securing that an adequate number of dock workers is available for the efficient performance of their work."

The various provisions of the Bill are set out in a subsequent notice in this issue and the only comment we are called upon to make here is to welcome this attempt to bring the entire range of dock labour, which is at present controlled by three separate and distinct organisations, into uniform practice, within the compass of a single authority. The existing labour force totals some 75,000 men, and it is now administered partly by the National Dock Labour Corporation and partly by Regional Directors on Merseyside and Clydeside.

In principle, both masters and men are agreed upon the expediency of such a measure. Details, of course, are subject to criticism and amendment. The centralisation of power carries with it an inherent tendency to promote autocratic officialdom, and we observe in the Schedule to the Bill a wide, and perhaps unduly wide, discretionary power assigned to the Minister of Labour in regard to the local schemes whether submitted to him for approval or of his own devising.

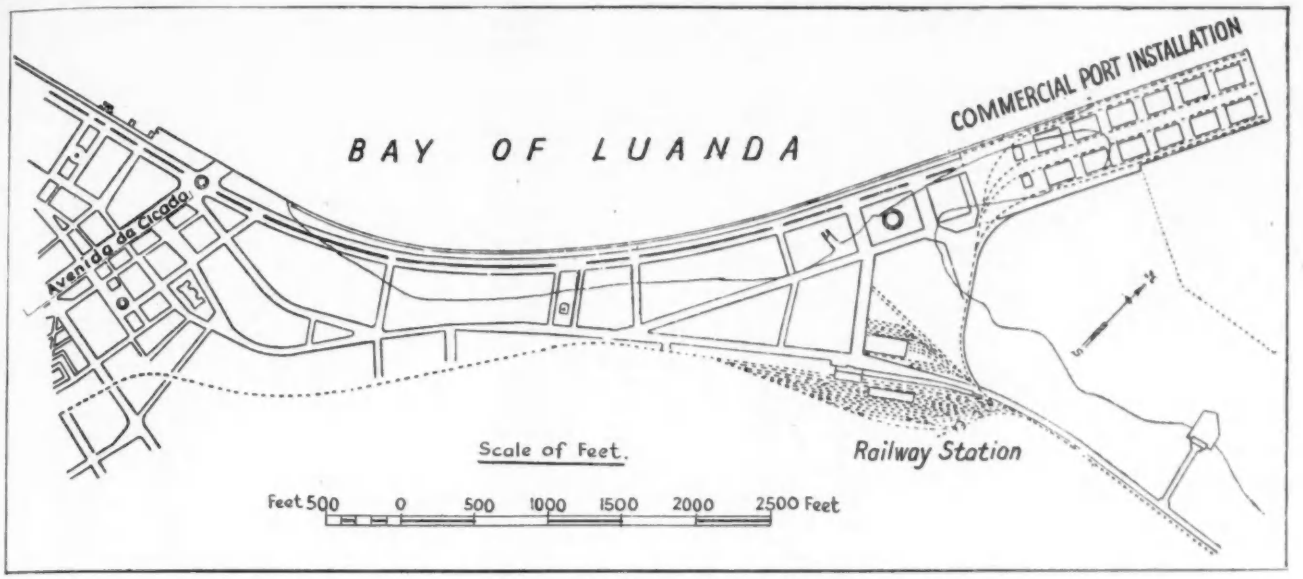
And here it may be mentioned that the National Dock Labour Corporation has just issued a booklet containing expressions of opinion on the subject of its Constitution, including speeches by Lord Ammon (reported at length in our August issue), by Sir Ronald Garrett, Vice-Chairman of the Association, and by Mr. A. Deakin, Acting General Secretary of the Transport and General Workers' Union. The booklet also includes an article by the Rt. Hon. Ernest Bevin, entitled "Some Thoughts on the Future," which we include in this issue, calling attention to its salutory warning on the futility and harmfulness of strikes.

Institute of Transport Presidential Address

The interests of the Institute of Transport are of so catholic a nature and cover so wide a field that it is unavoidable that certain sections of the industry should escape notice, or be remotely and obscurely treated in important official pronouncements such, for instance, as Presidential Addresses. The inaugural address delivered by Sir Frederick Handley Page on the occasion of his assumption of office on October 8th, full of interest as it is to the aeronautical section of the Institute, is an exemplification of this fact. In expatiating on the subject of air travel and reviewing the remarkable progress achieved in aviation during recent years, he made several appropriate references to road and rail transport as competitive forms of land travel, but his allusions to the domain of shipping and water-borne carriage were but few, while port activities were altogether ignored. Perhaps it could hardly be otherwise, in view of the eminence of the President in the realm of aviation; yet it does seem to us a matter for regret that the important effect of air services on shipping and ports should have received so little recognition. For here the incidence of aerial transport is bound to be productive of fundamental change.

Sir Frederick, it is true, remarked that "every reduction in aircraft operating costs, every improvement in aircraft efficiency, will widen the range of the aeroplane's competition with ship and train," but, merely adding that "sea routes are not necessarily the best air routes," he left the subject at that, without further comment. We could have wished, from so distinguished an authority, for some clearer exposition of his views on a number of matters which must arise from the association of seaplanes with ports and shippng, including the feasibility of their joint accommodation and operation in harbour waters and the probable ultimate determination of their respective spheres of action. The President claimed that "no doubt in future the cream of first-class shipping traffic will be skimmed by the aeroplane," and this well-founded anticipation must lead to a definite modification of policy on the part of ship owners, influencing their plans for new vessels and so, in turn, affecting the attitude of port authorities in regard to port developments.

However, from a strictly aeronautical point of view, the address was admirable in matter and presentation. It will be of the greatest value to all who are concerned with air transport and its development in the service of the community.



Comprehensive Plan of the Port District

The Port of Luanda

Striking Recent Development of a West African Port†

By A. DE M. CID PERESTRELO.*

Introduction

FOR those who know Portuguese West Africa, or for those who still retain memories of the geography of Angola, it will not be necessary for me to make this short introduction, which serves to open my description of the Port of Luanda, or Loanda, and its facilities—the theme chosen for my talk to-night.

However, for those unacquainted with Angola, or for those for whom its geography—and especially its physical geography—is merely a vague memory of many years ago, it is interesting to recall the outline of the coast of our largest and richest overseas province.

The Ports of Angola

As in the greater part of the territories occupied by the Portuguese, the coast of Angola—extending South of the Equator from French Equatorial Africa as far as South West Africa, approximately between the parallels of 5° and 18° with a length of more than 1,600 kilometres—comprises numerous inlets and bays, all of which act as excellent harbours and anchorages.

These are, firstly, in the Cabinda Enclave, Landana, in the Chiloango estuary: Malembe Bay, close to the headland of the same name and the bay of Cabinda, open on the north, like almost all the bays to which we are going to refer.

Then come the Zaire estuary, close to which is found the small port of Santo Antonio, followed by the ports of Ambrizete and Ambriz, situated on the open coast just before the Bays of Dande and Bengo; then Luanda Bay, which, owing to its natural conditions, is perhaps the best port on the whole of the West African coast.

South of Luanda, and at the mouth of the River Quanza (whose alluvial deposits, together with other deposits carried by the ocean currents, have formed the extensive coastal strip constituting the Island of Luanda) and following on the small bays of Port Amboim and Novo Redondo comes the port of Lobito. The latter, on account of its natural conditions and equipment, is at the present time the foremost port of Angola. A short distance away is the Bay of Benguela, which, by reason of its trade, was once among the most important ports on this coast. Then, as far as Mossamedes, follow a series of small bays of greater or lesser importance, serving as harbours and anchorages, among which I would mention Cuio, Lucira, Farta Bay, etc.

Mossamedes is another great natural harbour, as are also Porto Alexandre and the Bahia dos Tigres, both of the latter being situated farther to the south in the stretch of coastline bounded by the mouth of the Cunene River.

Of these ports, four—Luanda, Pôrto Amboim, Lobito and Mossamedes—are railway termini, not counting Cuio Bay, whither a narrow gauge railway brings the produce from the Dombo Grande, one of the big Angola sugar plantations.

Luanda, capital of the Colony, and its largest and most important population centre, is the main terminus of the railway which crosses the province of Luanda and which at present has its terminus at Malange, capital of the adjoining province. Owing to its importance for the future of the port of Luanda, we shall deal further with Malange at a later stage.

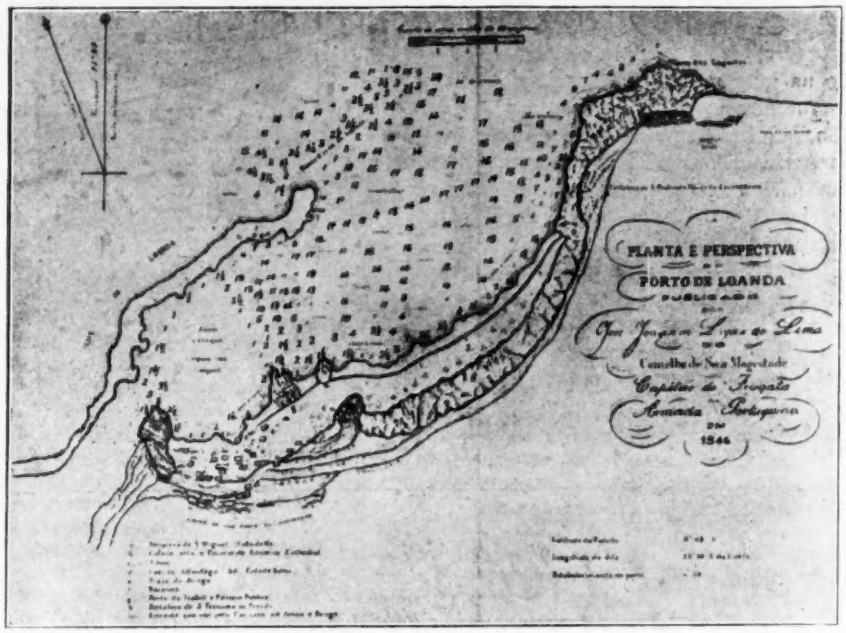
Pôrto Amboim, formerly " Old Benguela," situated at the head of a small local railway which serves the rich agricultural districts stretching as far as Gabela, lacks—as do others of the ports mentioned—the conditions suitable for any great development. Like some of the other small ports of the colony, it is served by a landing stage designed for coastal traffic, and its functions, like those of the majority of these small ports, are limited to a poor " hinterland."

Lobito is the head of an international railway, which, after crossing Angola for a distance of 1,334 kilometres, traverses the Belgian Congo and Rhodesia and continues through our province of Mozambique to the Indian Ocean. This is the shortest rail route for Central Africa. At this stage it would be apposite to give a short description of the port of Lobito. It is built on a reef forming the Bay of Lobito, the latter being more than 400 hectares in area and providing safe anchorage suitably equipped with stone-built quays and embankments. However, although this is

†Translation from the Portuguese of an Address given at the Higher Technical Institute (Instituto Superior Tecnico), Lisbon, on the 15th March, 1945.

*Professor of Engineering at the Institute.

Port of Luanda—continued



Plan and Chart of Port of Luanda in 1846

equally interesting, I am straying from my main subject—the port of Luanda.

Finally, I come to Mossamedes, the third great commercial port of Angola, with a railway linking it with the capital of the province—Sá de Bandeira. Sá de Bandeira, unlike Lobito or Luanda, does not possess berthing facilities, but has good natural conditions and a traffic capable of development. It will justify, as one of the first projects of its development, the construction of a " pier " or " boom " allowing big ships to come alongside, as in the case of the pier envisaged for Nóqui, a port situated on the River Zaire, close to the frontier of the Belgian Congo and near the limit of its navigable waters.

There is no reason, at least for the present, to think of establishing large ports at other inlets and anchorages on the coast of Angola, not even in its most extensive Bahía dos Tigres, which is more than 30,000 hectares in size and is capable of holding the largest fleets of the world, but which serves only a more or less desert region lacking immediate possibilities of improvement.

The appropriate fitting out of the three big commercial ports of Luanda, Lobito and Mossamedes, the construction at Nóqui of a pier allowing the berthing of ocean-going vessels, the improvement of one of the harbours in the district of Cabinda—possibly Landana—with facilities for utilising river routes for bringing down the products of this very rich region would, in my opinion, and for a long time to come, solve the problem of the ports of Angola.

Luanda and Its Harbour

Having made this little digression owing to the vastness of the territories of Angola, whose natural resources are limitless, I am now going to talk to you about Luanda itself and about its harbour, which is one of the best, largest, and most sheltered in the African continent.

It is situated in a wide extensive bay about four kilometres long and two kilometres wide, and is sheltered from north-westerly and south-westerly winds and storms by the slope on which the town stands, and by the sandbank which forms the Ilha de Nossa Senhora do Cabo or de Luanda, to-day linked with the mainland by a recent embankment; it is further sheltered on the north and north-east by Cape Dande, less than 40 kilometres away, and its anchorages extend over an area of more than 800 hectares, with a depth of more than 30 metres in many places.

Access to the harbour is easily made through an entrance more than one kilometre wide and of sufficient depth to allow the entry and exit of the largest ships using the port, whatever the height of the tide.

The harbour is bounded from north-east to south-west by a rocky coast which stretches from the headland of " das Lagostas " to the ridge on which stands the San Miguel Fortress; the deepest parts of the bay are found on the west side, bounded by an under-water ridge at a depth not exceeding 2½ metres and which drops rapidly until reaching a curve of 20 metres on a straight line from the Church of Nossa Senhora do Cabo on the Island, to the headland called " Mai Isabel " on the mainland. Extensive sandbanks are uncovered at low tide.

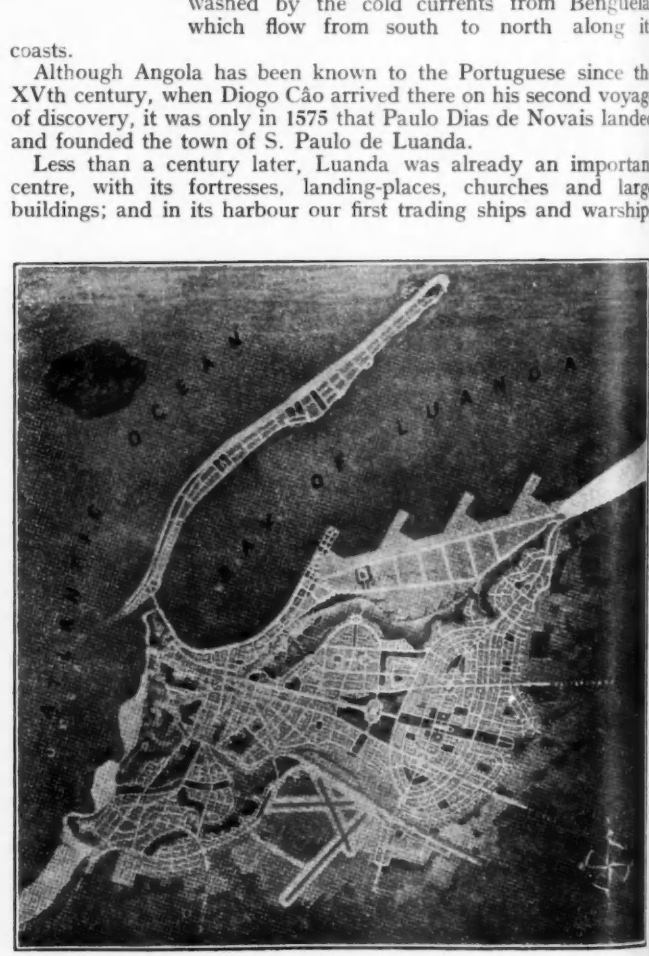
On the east, from the S. Miguel Fortress headland and for about 2 kilometres towards the slope of the Penedo Fortress, stretches the lower part of the town, which then continues southward with the slopes and plateaux which provide its picturesque beauty and its healthy conditions.

When first seen from the sea, the town presents an unpleasing aspect owing to the steepness of its slopes, which makes reinforcement and stone facing necessary, but it lends itself admirably to extensive development as a port.

In spite of the fact that it is in the tropics and quite close to the Equator, Luanda enjoys relatively low temperatures because the shore is washed by the cold currents from Benguela, which flow from south to north along its coasts.

Although Angola has been known to the Portuguese since the XVth century, when Diogo Câo arrived there on his second voyage of discovery, it was only in 1575 that Paulo Dias de Novais landed and founded the town of S. Paulo de Luanda.

Less than a century later, Luanda was already an important centre, with its fortresses, landing-places, churches and large buildings; and in its harbour our first trading ships and warships



General Plan of the Port of Luanda

Port of Luanda—continued

which went in search of distant lands found good protection, as shown in the illustration below.*

Harbour Works Prior to 1939

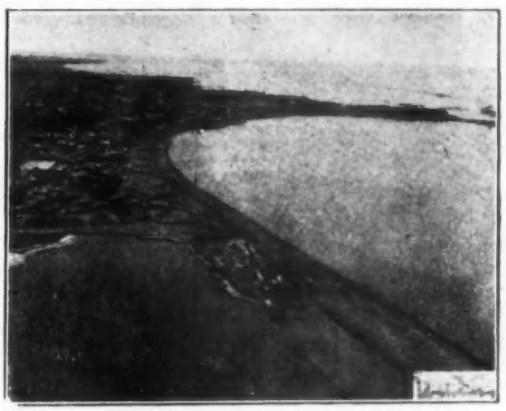
Although opened to foreign trade in 1844, it was only about two decades later that Luanda was provided with the first harbour installation at the instigation of the Governor, Calheiros e Menezes, who ordered a small jetty—known locally as " The Gates of the Sea " (Portas do Mar) and which even to-day is still used for the embarkation and disembarkation of passengers for ships anchored out in the bay—to be built there. It was not until much later, when the railway from Luanda to Ambaca was built, that suggestions were made to carry out the maritime work absolutely necessary for the efficient development of this railway, which was the first to be built in Portuguese Africa.

Various schemes were then drawn up, but none was put into operation, and still more decades passed before a few installations intended for the maritime traffic of the port were constructed. These latter consisted of simple bridges or piers for the exclusive use of the Railways, the Customs House, the Captain of the Port, and various other private individuals who used them.

A special fund for the construction of the harbour having been created in 1910, work was begun in 1913 on the construction of a small portion of a stone quay, intended to replace the existing jetty opposite the Customs House, and in 1915 Engineer Lopes Galvão, Inspector of Public Works in the Colonies, drew up a comprehensive scheme of works, including the levelling of the waterfront from the Island to the town, the building of large quays close to the railway station, the dredging of various approach channels, the construction of dry docks and slipways for shipbuilding, etc. None of these plans, however, were proceeded with.

In 1921, General Norton de Matos, then High Commissioner of the Republic in Angola, recognising the necessity for providing the port with the works indispensable for its improvement and appreciation in value, arranged a contract with the English firm of Norton Griffiths for the construction—according to a previously drawn up plan—of a stone quay on the Island suitable for ships of deep draught, for the levelling of the waterside, and for the construction of a quay opposite the town for coastal craft, as well as the equipment and fitting out of the harbour, including warehouses, cranes, railways, etc.

The execution of these works having been officially begun, their extension was soon afterwards considerably restricted owing to the financial position of the Colony, and the agreement with the contractors was cancelled in 1925, when they had built only a small part of the stone quay forming an extension of the Customs House quay.

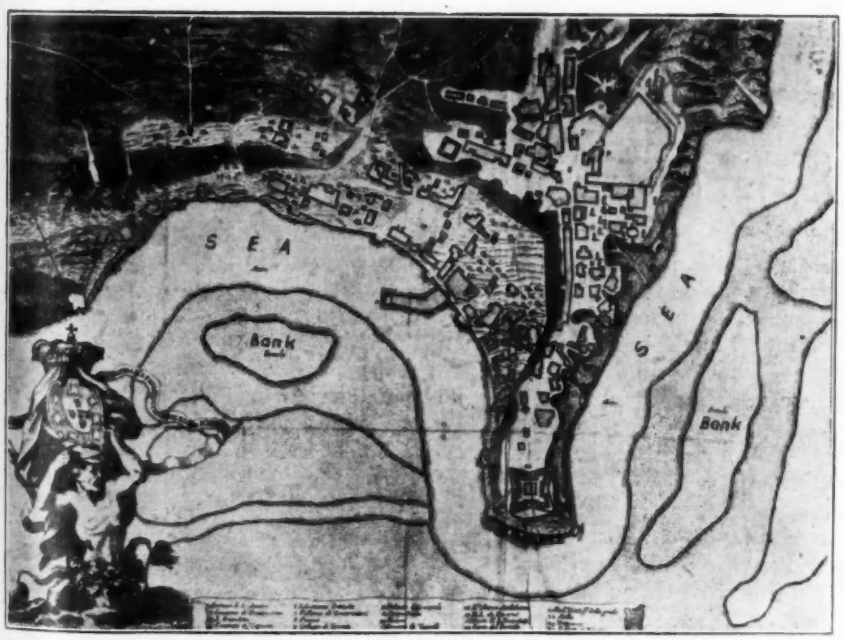


General View of Luanda Bay, showing Works in Hand September, 1944

In 1927 the problem of harbour works was again taken up by Engineer Vicente Ferreira, then High Commissioner, who had been ordered to study the possibility of building a pier at Mâi Isabel for mooring large vessels, linked with the shore by a mass of foundation stones, and its construction was begun shortly afterwards; but this project was also abandoned, such was the misfortune of the port, although there was no lack of plans.

Meanwhile the traffic of the port developed slowly and the railway from Ambaca, later extended to Malange, and which crossed some of the richest regions of Angola, brought its regular contribution of merchandise. These goods, after being unloaded at the Customs House quay, were then carried in lighters to the ships anchored some distance away, thus occasioning loss of time and uneconomic increased freight charges.

*From the book, "Istoria Delle Guerre Del Regno Del Brasile Accaduti Tra La Corona Di Portogallo e La Republica Di Olanda," Rome, 1698.



The City and Port of Luanda in the 17th Century (From an old print)

Work in Progress and Work Planned by the Survey Mission

In 1939, in accordance with the new policy of Colonial Development, a Commission was appointed at the request of the Minister—Vieira Machado—the direction of which was entrusted to me: to study the question of works required to be undertaken in the Port of Luanda. In March, 1940, this Commission presented a plan which was immediately approved, and for the execution of which tenders were invited in July of the same year.

The contract was awarded in March, 1941, to the firm Anglo-Dutch Engineering and Harbour Works Co., Ltd., and the preparatory work for the construction of the harbour was begun in June, 1941. This should be finished in three or four months' time.

I must now tell you of what these works consist, their outline, their principal characteristics and, lastly, a little of the great conception I had in mind and tried to carry out.

With a well-sheltered natural harbour, adequate depths of water, and a magnificent approach, it was only necessary to take advantage of the natural conditions and to build quays, berthing facilities and to level the waterfront opposite the town, as far as necessary for making it presentable and providing sanitation.

Port of Luanda—continued

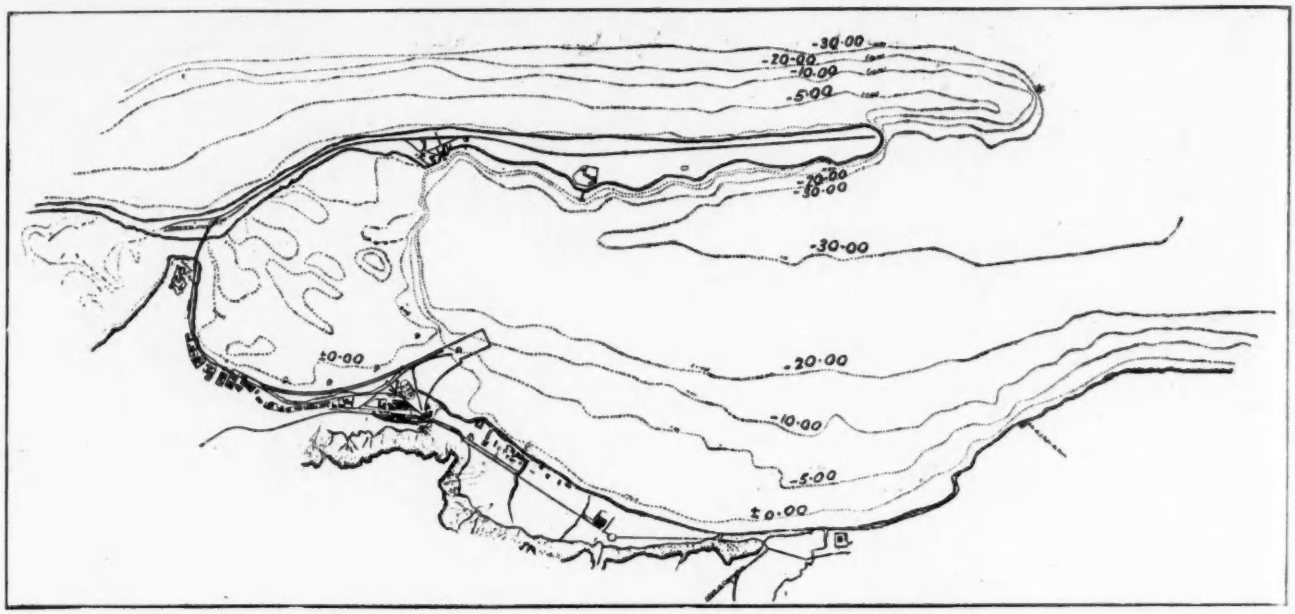


Chart of Coastline at Luanda, 1927, with indication of Works in Hand

As the port was already served by a railway, and the two services had to be closely correlated, we looked for the best position reached by the railway and nearest to the deepest waters for the erection of the huge embankments necessary for the harbour, within easy access of the town but at a suitable distance from it.

The outline of the work, conforming to all these conditions and bearing in mind the future development of traffic in the port, was that indicated on the plan in this article, the first jetty being situated close to the railway station and with the other end in waters sufficiently deep for mooring the largest vessels likely to use the harbour.

This first jetty, which will be completed in a few months time and to which the first large craft will be able to tie up in next May or June, will be followed by others as the development of the port demands and in a future which a greater utilisation of our colonial riches can bring quite near.

10-ton Caissons in lower part of Quay Structure

In the building of this jetty and the levelling of the waterside, which completes the first phase of the present works, 860 linear metres of quay have been built, founded at depths varying between 5½ and 11½ metres below water, allowing six large ships to be moored at the same time; 1,718 linear metres of waterside were built up, and about 300,000 square metres of embankment were built out into the sea, for which it was necessary to use about 230,000 cubic metres of stone (including the gravel for making the concrete), more than 30,000 cubic metres of building sand, about 18,000 tons of cement, and more than 2,000 cubic metres of wood. The volume of the mounds necessary for the filling reached more than 1½ million cubic metres.

The method of construction adopted for the quays was the use of huge blocks—90 tons each—made in a building yard and placed in position by means of a crane, mounted on a dredging lighter, by which the blocks were suspended and then placed in position by divers on the foundations which formed the substructure of the walls. In its lowest part the superstructure was built of hollow concrete caissons to a depth of half a metre below water. Like the large blocks, these were also made in a building yard and then placed in position by a small travelling crane. In their turn, these were also filled with concrete on site. The upper part of the superstructure was laid in courses of four metres. The earthworks were formed partly from the material obtained from the dredging of the foundations for the stone quays, embankments and approach zones and partly from the earth from the mounds close to the railway station, the platforms of which were thus lengthened considerably. In order to minimise the pressure on the earthworks adjoining the stone quays, a berm was built with foundation stones faced in the same way as the foundations of the embankments—with a mass of clay and stone fragments to render them waterproof and to avoid the washing away of the earthworks. The stone quays and embankments were provided with landing steps, mooring blocks and rings. The embankments will be fitted with drainage pipes of various types and sizes according to the waste matter they are designed to carry, the larger (2 metres and 2½ metres) being made on site and the smaller type (½ metre, ¾ metre and 1 metre) in workshops, and also the outlets which discharge on to the embankments and stone quays. The total estimated amount of drainage system for the harbour area is about 6,500 linear metres.

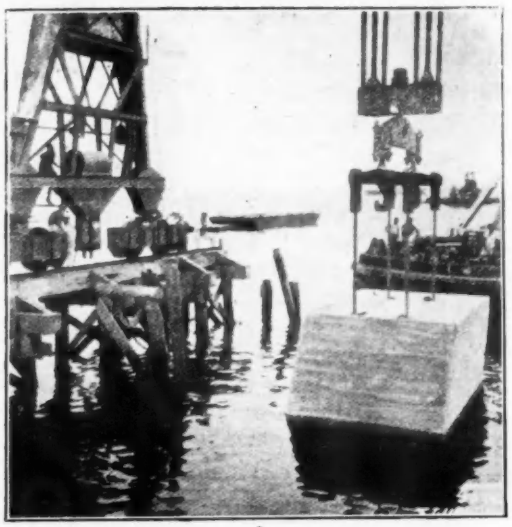
Execution of the Work in Hand

The building yard having been set up on the earthwork already built into the sea, the search having begun for stone quarries to supply the huge quantity of stone necessary for building the harbour and which had to be sought in various places, some of them far distant from the site of the work, and transport having been arranged, the execution of the harbour works was commenced in January, 1942, with the dredging of the foundations. In April, the laying of foundation stones was begun and continued with an ever-increasing rhythm. Levelling began in September with divers levelling the part designed to receive the blocks for the lower structure of the stone quays and with wooden caissons for the blocks destined to serve as the foundation of the embankments.

Port of Luanda—continued

The total amount of foundations levelled in little more than two years of work was about 14,000 square metres.

The manufacture of the large blocks, some 1,128 in all, was begun in June, 1942, at the same time as the 618 foundation blocks for the embankments. The total volume of concrete used in these blocks and in the caissons forming the lower part of the superstructures of the stone quays was 47,600 cubic metres.



Setting a Block of 90 Tons

In the manufacture of the blocks for facing the embankments, of the tubes for the drainage channels and of the coping-stones, now almost finished, 7,200 cubic metres of concrete will be used, a quantity of 6,500 cubic metres being necessary for the completion of the superstructures of the stone quays.

The total volume of concrete used is thus about 61,300 cubic metres.

The concrete plant included silos for the stone and for the sand, automatic measuring machines for these materials, storage depositories for the cement, elevators for the shingle and cement, apparatus for washing and sifting the shingle, carriers, cranes, trucks and a concrete mixer with a capacity of 30 cubic metres an hour.

The large blocks were cast in metallic moulds and were transported to the sea by a large bridge-type crane.

The yard, in addition to a main electrical installation for supplying the necessary power for the installations and apparatus employed, contains workshops, warehouses, storage depositories and offices, and is served by both rail and sea and by temporary quays where the greater part of the material used in the work was unloaded.

In spite of the war-time difficulties of obtaining materials, the work will be completed within the stipulated time, that is, in less than four years.

The execution of this work has meant the almost continuous employment of about 50 white men—managers, overseers, artisans, etc.—and more than 1,000 blacks recruited partly in Luanda and partly in the interior, all of whom, generally speaking, have shown themselves to be good workers. This native labour was used in most jobs and especially in the excavation and transport of stone and earth in the manufacture of concrete and similar duties.

Excavation in the stone quarries was carried out partly by blasting and partly by compressed air. For the excavation and loading of shingle brought from Calumbo on the banks of the River Cuanza, for the manufacture of concrete, a " Bucyrus " excavator was employed.

The excavation of earth for the earthworks and its unloading was performed by manual labour, the railway company's rolling stock being utilised for transport. The number of trucks loaded and unloaded up to the 31st December, 1944, amounted to 71,500, leaving a further 18,000 to 20,000 to be loaded and unloaded before the work is completed.

Equipment and Facilities of the Port

For the work in hand (which is now approaching completion), warehouses, enclosures, pavements, cranes, railway tracks, water and fuel oil pipes, lighting standards, drains, etc., were arranged for in the zone allocated to the commercial port, and which comprises, in the early stage, in addition to the first jetty, an adjoining zone bounded by the faced embankment and extending to the projected Praça do Pôrto.

The warehouses, already designed, the construction of which should soon be commenced, will be of stonework, covered with " Lusalite " built on a metal framework. Each will have an area of approximately 2,700 square metres and will be divided into three blocks with a gap of 15 metres between each. The foundations are designed to be of reinforced concrete blocks, set in wooden piers. The pavements will be in concrete.

The pavements of the quays and approach roads, also already planned, will be in stone, covered by a bituminous layer. These temporary macadam pavements will serve to carry the traffic during early development of the port, pending the construction of permanent road surfaces, and will form the best foundation for such surfaces, thus avoiding the necessity for their construction on newly-built earthworks.

For the Praça do Pôrto which it separates from the town and on the north side meets the end of the Avenida Marginal planned around the bay as far as the Island (Ilha) and which, in the first stage, will be constructed along the new reinforced embankment of the water's edge and from the present Customs House quays to the " Gates of the Sea," the architect, Paulo Cunha, designed an interesting scheme including buildings for housing the Customs, Harbour, Railway and Marine Transport Services and, in addition, those of the Harbour Development and the Economic Co-ordination Organisations—such as the Export of Cereals Committee, Cotton Committee, Coffee Committee, etc.—whose activities are closely connected with the port.

Along the Avenida Marginal, on the old waterfront and the new embankments recovered from the sea, provision is made for the erection of large buildings for the use of the principal commercial undertakings of Angola; these will give to the quayside portion of the town the presentable appearance which it now lacks and which will make it one of the most pleasing towns on the Atlantic Coast of Africa.

View of Port of Luanda in January, 1945

All this can be done in a short time with the facilities which will be given for the better and quicker use of the coastal areas.

Cost of the Works and Allied Projects

The works in progress, estimated to cost about 48,000 contos, will actually reach more than 50,000 contos, owing to the increased cost of materials. This payment was allowed for in the cost of the contract.

Port of Luanda—continued

The harbour equipment and facilities are estimated to cost about 18,500 contos and the construction of buildings for the Praça do Pôrto about 22,500 contos, allowing for the fact that the paving and building of the Avenida Marginal—which will naturally be handed over to the Municipality, together with the extension to the Island (Ilha)—will be credited with the proceeds of the sale of the land fronting on to it for building purposes.

The first phase of the works will thus cost less than 100,000 contos—or less than £1,000,000—approximately the same as the cost of Lobito Harbour, built about ten years ago.

Port of Luanda—Relief Model

For the supply of coal to the port, and until the special fuel installations included in the general plan of the port have been built, provision was made for reconstruction of the existing quay in the Ilha, which had been used by the Companhia Nacional de Navegaçao. The same type of construction as in the stone quays was utilised, and the reconstruction should already be in hand. A new forepart with large blocks will be built in front of the present quay and will be linked by a metal platform, similar to the existing one, to the part which gives access to the quay itself.

The work, planned to be completed in six months, is estimated at a little more than 3,000 contos.

Also, for the protection of that part of the Island of Luanda subject to the most violent " calemas " (storms) and which only a short time ago was cut off by the sea, provision was made for the continuation of the work begun some two years ago, consisting of protection by wooden piers, as used for the defence of the Lobito reef in similar circumstances and with excellent results (though this has not been the case at Luanda, where the difficulty of securing the piers and the lack of research work for the complete solution of the problem have made the small amount of work already carried out of little value).

In the general scheme outlined for the port, allowance was also made for the repair and overhaul of ships, for which purpose the port has only one slipway, the latter being insufficient for its present needs, quite apart from its future development.

The construction of a large dry dock—together with the necessary repair shops which would also serve the railways and local industry—was planned for the embankments to be constructed near the Penedo Fortress. This, or a similar work, indispensable for the complete fitting-out of the harbour, must be built according to the requirements and possibilities of the port.

In addition, a marine airport was planned close to the Penedo Fortress, to be used if an important seaplane base cannot be established on the other side of the Corimba reef, in the same way as in Hanni Bay in Dakar. The site chosen for this purpose is the place where, until the war, the planes of Air Afrique moored when landing there.

Economic Possibilities of the Port of Luanda

Having thus reviewed, firstly, the natural conditions of the Port of Luanda and then the works either in progress or in preparation, it now remains for me to say something about its economic importance, both present and future.

Served by one of the big railways of the Colony, a total length of some 600 kilometres, including branch lines, by various important rivers, such as the Cuanza—navigable for a distance of more than 200 kilometres—and by several thousand kilometres of roads, its " hinterland " extends over several thousand square kilometres covering vast agricultural and mining regions, the development of which depends partly on the facilities the port can offer for the export of its products.

With the extension to the north or north east of the railway line which serves it, and of which the port is the natural complement, with the improvement of this and other means of communication available (which the " post-war " period will render not only possible, but necessary) with the prospecting of the mineral deposits which would have their easiest outlet through this port, with the full cultivation of all the agricultural regions of its " hinterland "; with the completion of its hydro-electric developments, which will permit a greater consumption of power*, Luanda will be within a few years a great transit and commercial port for which the works now constructed will be inadequate.

Its traffic, which twenty years ago did not exceed 50,000 tons, was doubled in the last few years before the war, when the vast potentialities of Angola began to be utilised.

The coming years hold a great future for Angola in the new world which the rising generations must create and in which technicians will have a predominant part. For the very reason that in our African Colonies you can find vast scope for your activities and for your constructive effort, I have tried to deal with a matter which, while being of immediate interest, will a few months after the commencement of this great development project (which has been the subject of my talk) be of considerably enhanced interest in the future owing to the part which the ports, like other means of communication, play in colonial economics.

*A study of the hydro-electric development of the Mabubas has already been made and is expected to be carried out very shortly.

Death of a Distinguished Harbour Engineer

Port and Harbour Engineers in this country and elsewhere will learn with regret of the death of a distinguished Italian colleague, which took place, according to an intimation received just as we go to press, at Milan, on October 4th. **Prof. Dott. Ing. Enrico Coen Cagli** was associated with the construction of a number of port and harbour undertakings in Italy; at Genoa and Venice in particular. At the latter port, he was responsible for the creation of the important Porto Industriale, or Industrial Harbour. He was for some considerable time Professor of Engineering in the Universities of Padua and Rome, and he visited London in 1935 to deliver a lecture on Italian Harbours before the Institution of Civil Engineers. He gave much attention to the stability of Breakwaters and contributed papers on the subject to various technical periodicals, as also to the International Association of Navigation Congresses, on the Committees of which he served for several years.

Dock Labour

Unprecedented Demand for Higher Rates of Pay and Improved Status

On September 27th, the Unions representative of dock labour at British ports put forward an ambitious claim for better conditions of employment. The Unions asked for a 56 per cent. increase in the basic daily rate; a 40-hour week; permanent decasualisation of the industry; Grade 2 ports to be brought up to the higher minimum; two weeks holiday per annum with pay and payment for statutory holidays; retiring allowances for aged and infirm dockers and medical and welfare services at all ports.

Failing immediate concession by the employers of these extraordinary demands, and on a frivolous pretext at Merseyside, a large proportion of the men working at the chief ports of the country went on strike. Efforts made by their Unions to induce them to return to work pending negotiations were unavailing, and on October 18th the following statement was issued by the National Joint Council for the Port Transport Industry:—

"At a meeting of the National Joint Council for the Port Transport Industry on October 18th the employers' side presented to the Trade Unions their considered reply to the Trade Unions' claim submitted on September 27th, together with the employers' comprehensive proposals for the decasualisation and reorganisation of the industry. The employers called attention to the fact that there was a large section of men on strike and referred to Clause 18 of the constitution of the National Joint Council, i.e., 'No stoppage of work or lock-out shall take place locally, sectionally or otherwise, pending any matter being submitted to and adjusted in the conciliation procedure of this agreement and such adjustment shall be accepted by the parties as final.' In view of this, the Council were unable to make any progress by way of continuing the discussion at this stage. It was, however, agreed that the Council will hold itself in readiness for an immediate continuation of the discussions as soon as a general resumption of work takes place."

Employers' Proposals

The following statement outlining the employers' proposals for the decasualisation and reorganisation of the industry was also issued:—

"1. At the meeting to-day of the National Joint Council for the Port Transport Industry the employers submitted to the Unions two memoranda. The first outlined the employers' proposals for the post-war decasualisation and reorganisation of the industry, and the second gave the employers' reply to the Unions' claim of September 27th.

"2. The port employers have long been desirous of decasualising the docks industry. Before the war they raised the matter with the Unions and endeavoured to evolve a suitable scheme. Unfortunately, the outbreak of the war made it impossible for these negotiations to be brought to a successful conclusion. During many months past the employers have given much thought to the problem, and when they met the Unions on September 27th they intimated that a complete scheme would be ready for consideration at the next meeting of the National Joint Council.

"3. The Unions have asked for a permanent national scheme of decasualisation; an increase in the basic daily time rate from 16s. to 25s. per day; a 40-hour week; pensions; medical and port welfare services; two weeks' holiday with pay and payment for statutory holidays; and the application of the higher daily minimum wage to all ports irrespective of their size.

"4. In pre-war days the industry was very largely casual and the number of men seeking work at the docks was far in excess of port requirements. Wages and conditions were built on this basis. For example, a high daily wage was established because the average employment was not more than four days a week and the daily wage had to be high to compensate for under-employment. Similarly, overtime rates and working conditions in general were designed to secure as high earnings as possible to men only intermittently employed and to spread work over as many men as possible.

"5. During the war temporary dock labour schemes were introduced, but they left intact the industrial structure based on casual conditions. As war-time expedients they fulfilled their purpose, but they were uneconomic in operation and their system of administration was only designed for war-time circumstances.

"6. Dock work is intermittent in character because of factors (weather, tides, etc.) outside the control of the industry. Unemployment, therefore, cannot be eliminated, and the aims must be to reduce it to the lowest proportions and to give to the dock workers a reasonable financial security against under-employment. The employers fully recognise this need, and in their post-war plan they have prepared a new charter for the industry. They offer to every able-bodied dock worker employed at the greater ports a guaranteed minimum wage of £16 for each four weekly period. At the smaller ports the guarantee offered is £15. All earnings of the men while at work will count against the guarantee. It must be emphasised that the guarantees are the least amount a man will receive even if he does no work during the period, and this is a unique provision in any industry. In practice, many men will earn considerably higher wages.

"7. The guarantee is an insurance for the men against short-term employment. It represents a heavy liability for the employers and it cannot be implemented unless every encouragement is given to full employment. It is obvious that the employers must have the right to determine the number of men to whom they will guarantee employment, and restrictive practices and conditions militating against full employment must be revised.

"8. In addition, the employers offer improved holiday conditions; the extension and improvement, where necessary, of existing medical and port welfare services; and arrangements for orderly recruitment and training of workers. They are also willing to examine the present basis of piece-work, as the Unions ask, and to review the existing classification of ports.

"9. As regards pensions, some port employers already make retiring allowances to dock workers regularly employed by them, but viewing the matter nationally the obligation to give pensions to aged and infirm workers of any industry is one for the State under the national scheme, to which employers and workers in all industries contribute.

"10. The question of the 40-hour week is one for the Government to determine for industries generally. The dockers' normal working week is already only 44 hours, and overtime, at increased rates of pay, is work done outside the normal day hours regardless of whether the individual has done any work during the day.

"11. As regards the Unions' application for an increase in the minimum daily rate from 16s. to 25s. per day, the present rate is at the highest level in the history of the industry and was given in recognition of the intermittent nature of employment. The employers now propose that dock workers should, in future, be employed on permanent terms with a minimum monthly guarantee, and, in their view, the increase which the Unions seek in the daily rate is not justified on any economic or social ground. The increase would saddle the industry with an intolerable burden and endanger the export, import and coasting trades. Under existing conditions, dock workers can and do earn good wages without working long hours, and figures are quoted to show that in Liverpool, for example, recent average earnings of the men were £7 19s. 9d, for a working week of 45.2 hours. The increase proposed by the Union would put the wages of dock workers out of all relationship to those of other workers and would imperil the wage structure of industry generally. The result would be a process of inflation and the frustration of the Government policy of price control. The employers consider that if the claim is to be pressed by the Unions it will be necessary to ask the Government for guidance on the wage policy of the country. If the Government consider that wages in industries generally should be increased it would be necessary for the docks industry to adjust its proposals to the altered economy."

Appointment of Suez Canal Director

On the nomination of the Prime Minister and First Lord of the Treasury, Mr. A. R. Fraser has been elected to the Board of the Suez Canal Company in succession to Mr. N. E. Young. Mr. Fraser will hold the post of Resident Director.

Notes of the Month

New Italian Canal.

A new canal to connect the Tessen River with Milan and the Adriatic Sea is about to be undertaken, the first section being from Como to Milan.

Perth Harbour Appointment

Captain M. H. Smith, of Dundee, has been appointed harbour master at Perth in succession to Captain John Young, who has retired after over 26 years' service at the port.

Honour for Retired Engineer.

Mr. A. C. Gardner, F.R.S.E., engineer to the Clyde Navigation from 1929 until 1941, when he retired, has been presented by the Institution of Engineers and Shipbuilders in Scotland with the diploma of honorary membership.

Floating Dock on the Clyde

The large floating dock originally stationed at the Port of Southampton, but transferred to the mouth of the Gareloch during the war, is to remain on the Clyde, having been acquired by Messrs. Alexander Stephens & Sons, Ltd., Linthouse, for use in connection with their ship repair work.

Port Talbot Dry Dock

It will be recalled that the bucket dredger, *Don Federico*, belonging to the Great Western Railway Company, capsized and sank across the entrance to the Port Talbot Dry Dock in September, 1941. The vessel was slewed clear of the fairway by the Ocean Salvage and Towage Company, Ltd., and subsequently the work of breaking up and dispersing the wreck was taken in hand by Mr. J. A. White, of North Queensferry, Fifeshire. It is now reported that the job is completed.

Deep Diving Record

A Swedish engineer and scientist has recently lost his life in establishing a new deep-diving record. Mr. Arno Zetterström, the holder of the European record of 112 metres (367 feet) succeeded in descending from a submarine salvage ship near Landcort, in the Baltic, to a depth of 160 metres (520 feet) and telephoned to the surface his achievement. Unfortunately, the ascent was made too rapidly and Zetterström, having lost consciousness, never recovered.

The dive took place in a soft diver's dress and by means of a special air supply method developed by Zetterström. Instead of a mixture of helium and oxygen used by the Americans for deep diving, the Swedish scientist used a mixture of hydrogen and oxygen, and he had succeeded in eliminating the danger of explosion which this gas mixture involved. All the previous test dives had turned out according to his calculations and he was also convinced that it would be possible to descend to over 150 metres with the use of his method. He succeeded in this.

The Hudson Bay Route and the Port of Churchill

Replying in the Canadian House of Commons recently to a question regarding the maximum use of the Port of Churchill and the Hudson Bay route to Europe, the Minister of Transport, Mr. Lionel Chevrier, said that the policy of the Dominion Government was to use the port to the fullest possible extent. When the war with Germany ended, however, the Canadian Wheat Board attempted to obtain ships to move grain to Europe via Hudson Bay, but the British Ministry of War Transport declined to make vessels available, feeling that the ships might be lost or damaged in the hazards of the Hudson Bay route. The Minister of Reconstruction, Mr. C. D. Howe, said that the outlook for the Churchill port was not dark. The Government owned many suitable ships which could be used on the Hudson Bay route uninsured, while radar would help them to avoid ice. He believed that 20 million bushels of grain could be moved to Europe every year over this route. Few North American ports had moved more.

Proposed Free Port at Hamburg

The possibility of establishing part of the Port of Hamburg as a Free Port is stated to be under discussion by the British authorities in control of the port.

Newcastle Trinity House

The retirement at the end of the year is announced of Commander C. K. Sergent, secretary of Trinity House, Newcastle-upon-Tyne, an appointment which he has held since 1931. Captain Charles Cotter Brown has been elected to succeed Commander Sergent.

Belfast Harbour Commission

The newly-appointed chairman of the Belfast Harbour Commissioners, in succession to Sir Ernest Herdman, is Mr. John McCaughey, chairman of James McCaughey & Co., Ltd., flour and grain merchants, Belfast. Mr. McCaughey has been a Commissioner for 23 years and has served on most of the Standing and Sub-Committees for many years past.

Trondheim Harbour Development

It is announced that the Town Council of Trondheim has sanctioned an expenditure of 3,300,000 kroner on harbour extension works, the cost to be shared by the Norwegian Government, the Norwegian State Railways, the Harbour Board and the Town Council.

Panama Canal Locks

It has been announced by the United States War Department that a third row of locks is to be constructed in the Panama Canal zone. Construction of these locks, at an estimated cost of £50,000,000 was approved by U.S. Congress in 1939. The original scheme is now under re-consideration to provide for any change in design which may be required.

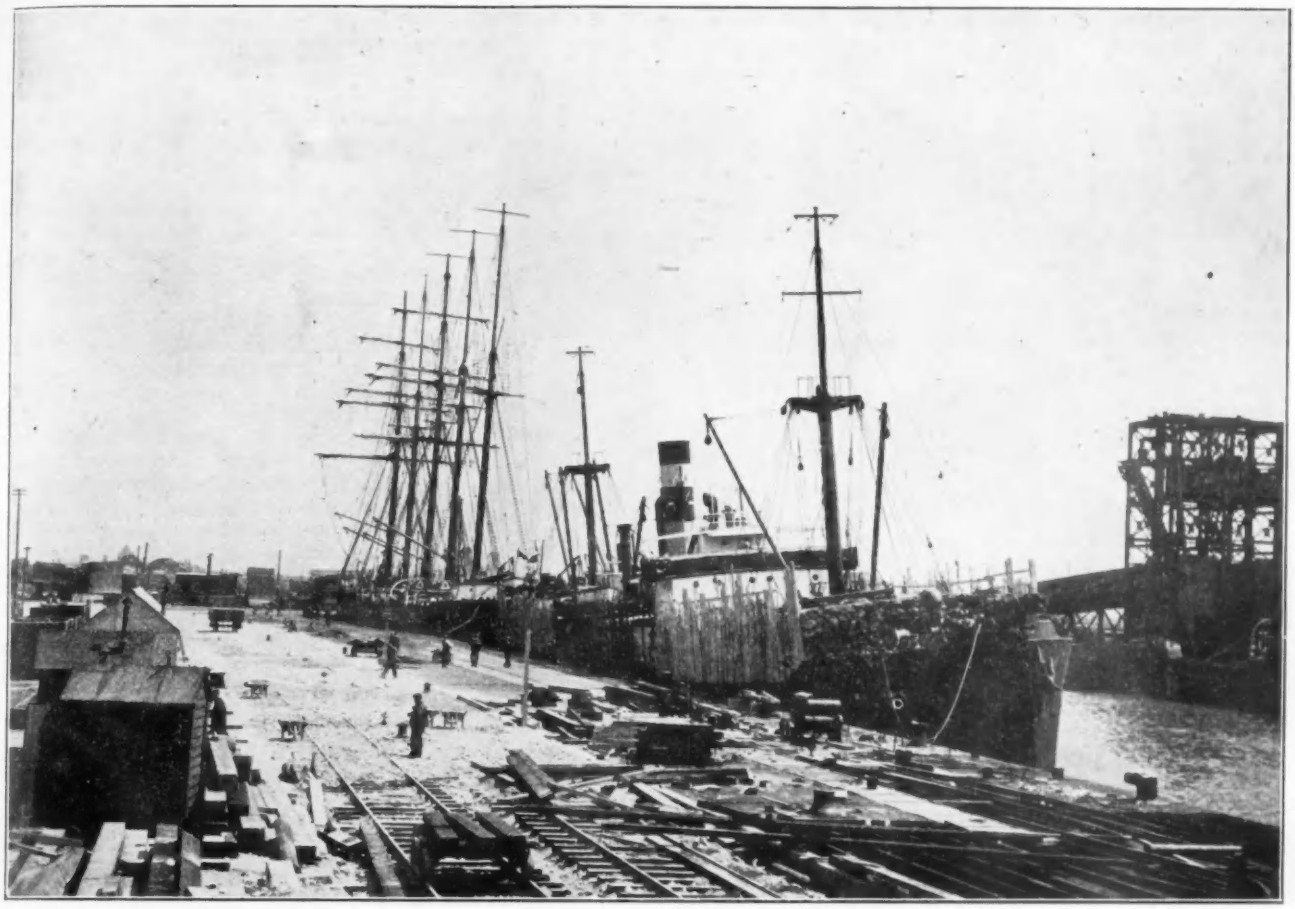
Customs Re-adjustment at Port Tewfik

The Customs Area at Port Tewfik is being vacated by the military authorities in Egypt and reinstated as a storage ground for goods. Material for the construction of new sheds on the old military transport parking ground is already on hand at Suez, and their erection will be commenced immediately the military authorities have completed the formalities of transferring the ground back to the Custom authorities. This will result in the eventual closing down of what has been known as Desert Site No. 1, and the reversion to storage of all goods within the Customs area proper at Port Tewfik. With regard to the North Quay and adjacent sheds, the military authorities will continue to retain the exclusive use of them for a further period of about six months. This will constitute the only area in the commercial basins of Port Ibrahim, which will be under military control.

Medical Centres for Dockers at Liverpool

At the meeting of the Mersey Docks and Harbour Board, on October 11th, a Resolution was passed authorising the provision of an additional Medical Centre to serve the South End Docks and to be situated at the Coburg Dock Yard, for the sum of £4,764. This is the fifth Centre of its kind to be provided for the use of dock labourers and other ship workers in the port and will cater for about 5,000 men.

The first experimental Centre was opened at the East End of Huskisson Branch Dock No. 3 in October, 1943, and since that time further Centres have been constructed at Gladstone Branch Dock No. 2, Gower Street, near the Albert Dock and Vittoria Dock, Birkenhead, and during the period between October, 1943, and the present date, 56,955 cases have been dealt with; new cases 20,195, re-dressings 36,760. Of the new cases, 12,704 were dock labourers. The new Centre will be staffed by two State Registered Nurses under the supervision of Dr. E. Holland, the Medical Director.



Timber Berths—Hull Victoria Dock

The Humber Ports in War-time

By a Special Correspondent.

Pre-War Conditions

THE River Humber has been described as the great natural channel for the flow of merchandise into and out of eastern England. As early as the twelfth century, indeed, Hull, which is situated on the north bank, had attained a position of high importance in the trade of the country. Together with Grimsby, which lies at the mouth of the Humber, 15 miles south-east of Hull, and Immingham, mid-way between the two, these three make up The Humber Ports of the London & North Eastern Railway.

In peace-time the vast network of docks owned by the L.N.E.R. at these three ports comprised one of the most important avenues of trade into Britain. They were ideally situated for inexpensive distribution of imports and had unrivalled rail connections to all parts of the country; Hull, in fact, was famed as Britain's cheapest port and most convenient for the Continent.

Whilst an enormous tonnage of general merchandise was dealt with at these three places, there were certain traffics with particular associations. Hull was probably the fruit centre of Europe and, owing to its proximity to Bradford, was the natural channel for the flow of raw wool from Australia into Britain and thence to the West Riding of Yorkshire. There was accommodation for 750,000 qrs. of grain, while the growth of the oil seed trade required imports of these commodities amounting to 750,000 tons a year. Provisions, frozen meat, timber of all kinds, and, of course, the fishing industry provided other vastly important cargoes. Lastly, the deep-water jetties at Salt End, which provide berthing accommodation for the largest oil-carrying vessels afloat to discharge mineral oils, dealt with imports of 750,000 tons a year.

Grimsby, in its turn, though dealing with many of these traffics on a smaller scale, was best known, and rightly so, for fish. Other imports were butter, bacon and eggs from Esbjerg, and heavy imports of timber from the Baltic and Russia. Owing also to its proximity to the extensive potato growing acres of Lincolnshire, a very large tonnage of Scotch seed potatoes was received by coastwise steamers for distribution inland.

Immingham, the third of the L.N.E.R. Humber ports, being the nearest to the heavy industries centred around Scunthorpe, chiefly imported iron ore, pit props and timber, whilst its exports consisted mainly of coal, iron and steel and basic slag.

This, then, in brief, was the position at these three ports up to September, 1939. They had been built up to an importance that would have seemed unbelievable before the advent of railways, and millions of pounds had been sunk by the L.N.E.R. and its predecessors to make them up-to-date and efficient in every way

Outbreak of Hostilities

On the outbreak of war a skeleton scheme that had been drawn up in 1936, when Britain was in so many ways unprepared, was put into operation. The River Humber was placed under the control of the Naval authorities and the Flag Officer, Humber, after a short period at Hull, established his base at Immingham.

Humber Ports in War-time—continued

Albert Dock, Hull. Damage caused by Air Raid, 31st March, 1941. View from upper window of H.M. Customs Office

The Port & Transit Control section of the Ministry of Transport came into being and delegated the executive authority at Hull, Grimsby and Immingham to Port Emergency Committees stationed at each place. The Chairman of the Hull Port Emergency Committee was the L.N.E.R. District Superintendent, Hull, whilst at Grimsby and Immingham the L.N.E.R. Port Masters were the Chairmen.

The early days of the war saw an immediate and heavy fall in the normal cargoes dealt with. The traffic with Hamburg and Bremen, not unnaturally, was the first to stop; the wool boats from Australia no longer made the long sea journeys; the imported timber traffic fell away; and the vast fleet of up-to-date trawlers which had grown up at Grimsby and Hull were taken from their peace-time tasks overnight. At Hull, 220 of the 277 trawlers which used St. Andrew's Dock were commandeered by the Admiralty, while at Grimsby the pre-war fleet of 430 trawlers was reduced to 68 by the same authority.

There was a temporary spurt in coal shipments to France and for a time the dairy produce from Denmark continued to arrive at Grimsby, but on the fall of France and the German occupation of Denmark these cargoes ceased. By 1940 the average pre-war imports into Hull of 6,500,000 tons had dropped by 2,000,000 tons. Air attacks and the extreme vulnerability of the East Coast brought a further drop of 500,000 tons in 1941 and by 1943 little more than one-third of the pre-war imports were arriving at these three ports.

Operation in War-Time

Thus the peace-time traffic of the Humber ports virtually came to a standstill, but in its place there arose all the multiple ramifications connected with the war effort. The Port Emergency Committees were responsible, within the dock areas, for keeping things working smoothly, for the loading and unloading of strange cargoes and crated goods, which taxed the resources of the cranes and mechanical appliances to the utmost, and for co-ordinating the demands of the Admiralty and the Port and Transit Control for countless other exceptional tasks.

In addition to the actual loading and unloading of cargoes, the 20 miles of quays and berths at Hull, Grimsby and Immingham, the dock and water area comprising 400 acres and the surrounding land were alive with men engaged on complementary war-time activities; 235 air raid shelters, designed to accommodate 11,500 people, were erected on the Hull Docks, and sites for barrage balloons and 33 anti-aircraft guns were provided. The normal fire-fighting equipment was enlarged out of all proportion and fire floats moored at strategic points in the dock water area.

Anti-gas precautions and decontamination measures of a very elaborate nature were installed, for in addition to personnel and property, the possibility of having to decontaminate the ships was always a contingency that had to be envisaged.

Movement Control and other services had to be provided with Nissen Huts and additional accommodation provided for the augmented police staff, whose responsibility it was, amongst other duties, to examine the papers of nearly 100,000 persons to whom permits had been issued as having legitimate business within the areas of the three ports.

In April, 1940, the Admiralty took over a portion of Alexandra Dock, Hull, for establishing a Demagnetization Station for "degaussing" ships, and in the same year the oil jetties at Salt End, which stretch out 1,500 feet into the River Humber, were fitted with three torpedo tubes and accommodation on the site provided for the necessary naval personnel.

The outstanding deep water dock facilities at Immingham were extensively used by the Admiralty for a multitude of war requirements, while the eight hydraulic coal hoists, each capable of shipping 700 tons in an hour, were in constant use by naval vessels of all descriptions.

No. 1 Fish Market, St. Andrew's Dock, Hull. Damaged 18th March, 1941

Humber Ports in War-time—continued

At Grimsby the extensive and up-to-date fish docks, comprising a combined water area of 64 acres, were taken over by the Admiralty and extensively used by naval craft throughout the whole period of the war. The huge warehouse at King George Dock, Hull, which used to house thousands of bales of wool, was used as a store by the naval authorities, and the graving docks at Hull, Grimsby and Immingham were commandeered for repairing ships. In fact, there was not a single dock but that had space or buildings requisitioned for personnel, whether civil, military or Home Guard; or for food, ammunition, scrap metal, fuel, timber, phosphates and a hundred and one other vital commodities too numerous to mention.

Aerial Attack

In the midst of this vast co-ordinated war effort, there fell, on the 1st July, 1940, the first enemy bomb. This set alight to a storage tank on the Anglo-American Oil Company's premises at Salt End and gave a fiery warning of the almost incessant attacks that were to be made by the enemy to wipe out the Port of Hull during the following two years.

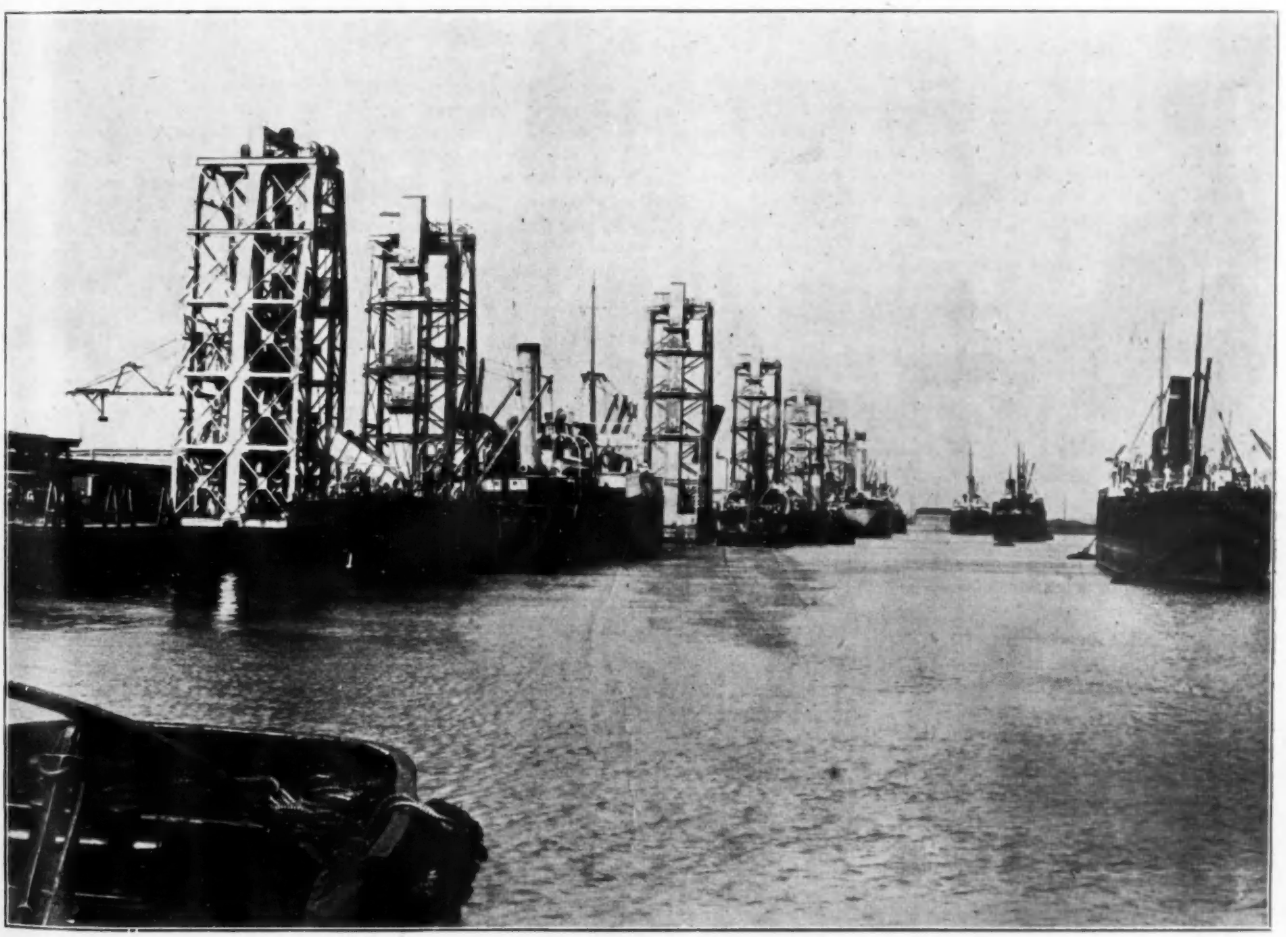
During the period of these attacks Immingham escaped almost unscathed, while at Grimsby, out of a total 700 alerts, there were 37 actual raids. Apart, however, from the destruction of the fish market, No. 2 fish dock and a warehouse, Grimsby was singularly fortunate in suffering no really heavy damage. The dock area did experience, though, the first anti-personnel bomb raid that was launched on England, thousands of the missiles falling in the area. The courage shown by the L.N.E.R. staff in dealing with the bombs enabled work to be continued with very little interruption and two members of the staff were awarded the British Empire Medal for their work during this raid.

It was on the network of docks in Hull, however, that the enemy vented their spleen. Not a dock escaped, warehouses were demolished, gas and water mains destroyed, lines torn up, whole quays destroyed, mechanical appliances twisted out of shape, and on some of the worst nights the whole dock area seemed on fire.

In May, 1941, there were stored at Hull 60,000 standards of timber, representing roughly 150,000 tons, including a large quantity of pit wood. On the nights of 7th and 8th May, 1941, two particularly long and vicious attacks set huge piles of this wood afire, destroying over 30,000 standards and transforming the whole area into an inferno of fire and flying sparks. On these same two nights the Riverside Quay at Hull was gutted by fire, and 1,100 wagons standing on siding lines at King George and Alexandra Docks were wholly destroyed.

Indeed, on these two disastrous nights the proud Port of Hull was very nearly brought to a standstill and the scene of desolation when daylight came was indescribable. Fires were still raging at every one of the docks, machinery was leaning at fantastic angles, sheds, warehouses, quaysides and houses were reduced to rubble, and lighters and barges lay sunk or afire at their moorings. Electricity, gas and water had failed, the telephones and signalling appliances had ceased to function and all rail access to Alexandra Dock was completely severed.

Yet the Port of Hull carried on. Innumerable acts of bravery and devotion to duty were recorded by L.N.E.R. men during this period and 20 recommendations for awards were made. The Company's engineering staff performed miracles of restoration to rail tracks and roads; imports were removed further inland and exports only sent in when actually required to load. Extra marshalling, reception and departure sidings were brought into use,



Coal Hoists at Immingham Dock

Humber Ports in War-time—continued

and the Port of Hull carried on. The worst was over and although almost up to the end of the war Hull had an uninterrupted succession of air raids they never again assumed the magnitude of the attacks of May, 1941.

Post-War Recovery

The time when it became evident that the air menace to the East Coast had been largely overcome coincided with the gradual build-up of American Lease-Lend aid and supplies began to come across the Atlantic in "Liberty" and "Victory" ships to make the Humber Ports increasingly busy once more. The deep water docks at Hull and Immingham were equipped with improvised floating cranes to enable them to lift the armoured fighting vehicles and landing craft, many of them weighing up to 50 tons, which were being shipped from American ports. From early 1942 until 1944 Immingham was used by the Americans for the discharge of supply ships and Lease-Lend cargoes. Frequently it was necessary to continue operations throughout the 24 hours and the United States authorities supplied labour to assist in the discharge of the vessels.

At the same time as the flood of war materials of all descriptions from America was building up, those deep water docks were heavily engaged in loading ships outward bound for Russia the Middle East, and later, North Africa, Normandy, Mulberry Harbours and European ports.

Some of the fifty Danish fishing boats which put into Victoria Dock, Hull, after being freed from German control

Invasion Preparations

Grimsby, Immingham and Hull, along with other ports, took their share in concentrating on the preparations for the invasion of Europe. At Immingham, many of the huge concrete piers, which ultimately became part of "Mulberry," were accommodated, while at Grimsby every available berth was used for loading vessels destined for the Normandy beaches. The storage sidings were filled with stores of all kinds and the shipments continued at great pressure until the liberation of Antwerp enabled larger vessels to be used and recourse was then had to Immingham.

At Hull, "D-Day" preparations reached their climax between May 26th and June 6th, when 83 special trains were run conveying stores, food and raw materials for shipment to Normandy, and during this time prodigies of loading were performed at the docks.

When it is remembered that everything loaded from wagon to ship had to be in the order required for out-turn by the Army of Invasion, some idea can be obtained of the magnitude of the task that faced everyone.

That the railwaymen and all ranks at the Humber Ports rose to the occasion, as indeed men did all over the country, was a vital factor in the launching, on that grim cold morning of 6th June, of the fantastic invasion fleet which, amazing the world, encompassed the utter defeat of Germany in 11 months

Dundee Harbour Development

Proposed Modifications in Original Scheme

The subject of a larger dry dock for the port has engaged the attention of the Dundee Port Authority for some time and they have urged its necessity upon the Government on several occasions, by means of interviews with officials of the Ministry of War Transport and the department of the Secretary of State for Scotland.

At a recent meeting of the Committee of the Trustees on Harbour Developments, the chairman, **Mr. H. Giles Walker,** said that while they had every intention of pressing their claim for a dry dock, it was also necessary that certain other works should receive consideration. In the General Manager and Engineer's Report of March, 1943 (published in the issue of *The Dock and Harbour Authority* for June, 1943), particular attention was drawn to the condition of the Western and Eastern Wharves, and the former required attention at the earliest possible date.

In view of the Board's preference for a scheme of work which would permit of harbour extension, tidal model experiments were authorised, and work on this essential preliminary to development was in hand. While no major departure from the existing frontage should be fixed until the results of the experiments were known, there was no reason why the new development scheme, in so far as it coincided with existing contours, should not be started.

The 1943 report showed that the Western Wharf was to be reconstructed in alignment with the King George V. Wharf. He understood from Mr. Matheson that he now considered it desirable to modify that and reconstruct the Western Wharf for a length of approximately 600-ft. from the east end, on a line slightly riverwards from its existing line. This length of 600-ft. would give berthage for two coasting vessels, but would render the shed at the west end of the wharf useless for direct working between ship and shed. By the time such reconstruction could be completed the results of the model experiments should be available, and consideration then given to the form in which further extension should be carried out.

He felt they should not limit themselves to putting forward one or two sections of a development scheme, but should rather submit a full scheme of development. These proposals could be submitted to the Ministry of War Transport, the Board of Trade and other Departments.

Finally, Mr. Walker proposed that their general manager and engineer prepare a general statement, setting out a programme of works, and wherever possible giving alternative proposals for each stage of development. Before the scheme was placed before any of the Government Departments, Mr. Matheson should discuss it with the Regional Port Director for Scotland. The Committee agreed to recommend Mr. Walker's suggestion be adopted by the Board.

Dock Workers (Regulation of Employment) Bill

Text of Bill presented to the House of Commons by the Minister of Transport, 11th October, 1945

Explanatory and Financial Memorandum

At present, the employment of dock workers is regulated on Merseyside and Clydeside by means of schemes entered into voluntarily by the workers and their employers and administered by the Minister of War Transport, and elsewhere by means of schemes under the Essential Work (Dock Labour) Orders administered by the National Dock Labour Corporation.

Unless further steps are taken, the existing schemes administered by the National Dock Labour Corporation will come to an end on the expiration of the Emergency Powers (Defence) Acts and those administered by the Minister of War Transport whenever the parties to those schemes (or any of them) so decide.

The object of the present Bill is to enable permanent schemes to be made for ensuring greater regularity of employment for dock workers and securing that an adequate number of dock workers is available for the efficient performance of their work. Schemes may be either general or for particular ports or classes of workers.

Clause 2 and the Schedule lay down the procedure for making schemes, either jointly by representative bodies of workers and employers, subject to confirmation by the Minister, or, after 31st December, 1946, by the Minister in any case where a scheme is not already in force under the Bill. Clause 2 (3) enables the Minister to take action in the event of the termination of any of the schemes at present administered by the Minister of War Transport. Clause 2 (7) provides for the laying of schemes before Parliament and for their annulment by resolution of either House.

Clause 3 enables existing schemes administered by the National Dock Labour Corporation to continue in force until the 1st July, 1947, unless superseded by schemes under the Bill.

The schemes will provide for the way in which their cost is to be defrayed. It is not intended that this provision should create any permanent charge upon the Exchequer. The Minister may, however, with the consent of the Treasury, make loans towards the cost of the operation of schemes to tide over periods of temporary difficulty (Clause 4). It is not possible in advance of experience to estimate the extent to which such loans may be necessary, but it is intended that they should be repayable and that they should bear interest. Sums received by the Minister in respect of loans will be paid into the Exchequer (Clause 5).

The administrative costs incurred by the Minister in pursuance of the Act will be defrayed out of moneys provided by Parliament (Clause 5). These costs will arise particularly in connection with the examination, preparation and approval of schemes, the publication and making of orders, and the expenditure incidental to the carrying out of enquiries into objections made to draft orders (paras. 3 (2) and 5 of Schedule). No additional staff will be required and the expenditure will not be substantial.

Provisions of the Bill

1. (1) Provision may be made by scheme under this Act (hereafter in this Act referred to as a "scheme) for ensuring greater regularity of employment for dock workers and for securing that an adequate number of dock workers is available for the efficient performance of their work.

(2) In particular, a scheme may provide—

(a) for the application of the scheme to dock workers and employers as may be specified therein, for prescribing the obligations of dock workers and employers subject to which the scheme may apply to them and the circumstances in which the scheme shall cease to apply to any dock workers or employers, and for prohibiting or restricting the employment of dock workers to whom the scheme does not apply and the employment of dock workers by employers to whom the scheme does not apply;

(b) for regulating the recruitment and entry into the scheme of dock workers and their allocation to employers, and for securing that in respect of periods during which employment, or full employment, is not available for dock workers to whom the scheme applies who are available for work, such workers will subject to the conditions of the scheme receive not less than such pay as may be thereby provided;

(c) for securing that the rates of remuneration and conditions of service for dock workers to whom the scheme applies (including conditions as to holidays and pay in respect thereof) will be in accordance with any national or local agreements for the time being in force;

(d) for making satisfactory provision for the training and welfare of dock workers, in so far as such provision does not exist apart from the scheme;

(e) for prescribing the manner in which, and the persons by whom, the cost of operating the scheme is to be defrayed.

(f) for constituting or prescribing a body of persons to be responsible for the administration of the scheme; and

(g) for such incidental and supplementary matters as may be necessary or expedient for the purposes of the scheme.

(3) A scheme may declare, as respects any provision of the scheme other than a provision requiring the payment of money, that a contravention or failure to comply with that provision is an offence.

(4) Any person who contravenes or fails to comply with any provision in relation to which such a declaration is in force shall be guilty of an offence under this section, and shall be liable on summary conviction to imprisonment for a term not exceeding three months or to a fine, or to both such imprisonment and a fine.

Provided that in the case of any person not being a body corporate the fine shall not exceed fifty pounds.

(5) A scheme may relate to any port or ports in Great Britain, and either to dock workers generally or to any class or description of such workers.

2. (1) A scheme may be prepared jointly by bodies of persons appearing to the Minister of Labour and National Service (hereafter in this Act referred to as "the Minister") to be representative respectively of dock workers of the class or description and at the port or ports to which the scheme relates and of their employers, and when prepared shall be submitted to the Minister.

(2) If at any time after the thirty-first day of December, nineteen hundred and forty-six, no scheme is in force for any port or in relation to any class or description of dock workers, the Minister may prepare a scheme, for the port or in relation to the class or description of workers in question.

(3) Where immediately before the passing this Act arrangements for the purposes mentioned in sub-section (1) of section one of this Act were in operation at any port under agreements made on behalf of His Majesty, then if at any time before the first day of January, nineteen hundred and forty-seven, no scheme is in force for the port and it appears to the Minister expedient so to do on the grounds that the said agreements have been, or will shortly be, terminated either entirely or to such an extent as to prejudice the efficient operation of the arrangements, he may prepare a scheme for the port.

(4) Any scheme may be varied by a subsequent scheme prepared and submitted to the Minister as mentioned in sub-section (1) of this section, or by a subsequent scheme prepared by the Minister.

(5) A scheme shall not take effect until embodied in an order made by the Minister in accordance with the provisions of the Schedule to this Act, and the date on which it takes effect shall be such date not earlier than the making of the order as may be specified therein.

(6) A scheme may be revoked by order of the Minister made in accordance with the provisions of the Schedule to this Act either on the joint application of such bodies of persons as are mentioned in sub-section (1) of this section or otherwise.

(7) An order under this section shall be laid before Parliament as soon as may be after it has been made, and if either House of Parliament within the period of forty days beginning with the

Dock Workers (Regulation of Employment) Bill—*continued*

day on which any such order is laid before it resolves that the order be annulled, the order shall thereupon become void, without prejudice, however, to the validity of anything previously done thereunder or to the making of a new order.

In reckoning any such period of forty days as aforesaid no account shall be taken of any time during which Parliament is dissolved or prorogued, or during which both Houses are adjourned for more than four days.

3. The expiration at any time before the first day of July, nineteen hundred and forty-seven, of the Emergency Powers (Defence) Acts, 1939 and 1940, shall not affect the continuation in force until that date of any dock labour scheme made under the said Acts and in force immediately before the expiration thereof, or of the provisions of any regulation or order made under those Acts and in force as aforesaid (including provisions as to the variation and revocation of such schemes) in so far as the provisions have effect in relation to any such scheme.

4. *The Minister may with the consent of the Treasury make loans towards the cost of the operation of schemes to such persons and on such terms as he may with the consent of the Treasury determine.*

5. *Any expenses incurred by the Minister in pursuance of this Act shall be defrayed out of the moneys provided by Parliament; and any receipts of the Minister in respect of loans made under the last foregoing section shall be paid into the Exchequer.*

6. In this Act the following expressions have the meanings hereby assigned to them respectively, that is to say:—

"cargo" includes anything carried or to be carried in a ship;

"dock worker" means a person employed or to be employed in, or in the vicinity of, any port on work in connection with the loading, unloading, movement or storage of cargoes, or work in connection with the preparation of ships for the receipt or discharge of cargoes or for leaving port;

"employer," in relation to a dock worker, means the person by whom he is employed or to be employed as aforesaid;

"port" includes any place at which ships are loaded or unloaded.

7. This Act may be cited as the Dork Workers (Regulation of Employment) Act, 1945.

SCHEDULE

Provisions as to Making of Orders

1. (1) Where it appears to the Minister that a scheme submitted to him makes satisfactory provision for the purposes mentioned in sub-section (1) of section one of this Act, or where the Minister has prepared a scheme, he shall prepare a draft of an order embodying the scheme and give notice of the preparation of the draft and that he proposes to proceed with the making of the order.

(2) Where, whether on an application made to him or otherwise, it appears to the Minister expedient to make an order revoking a scheme, he shall prepare a draft of the order and give notice as aforesaid.

(3) Where it appears to the Minister in the case of any scheme submitted to him that it would not be expedient to give effect to the scheme in the form in which it was submitted to him, he may refer the scheme with his observations thereon to the persons by whom it was submitted to him for their further consideration, and thereupon they shall reconsider the scheme in the light of the Minister's observations and may again submit the scheme to the Minister either with such amendments as they think fit or without amendment.

2. A notice under the foregoing paragraph shall be published in such manner as appears to the Minister best suited for bringing it to the attention of persons concerned, and shall specify a place where the draft of the order may be inspected, and copies thereof obtained at all reasonable hours, and the time (not being less than forty days from the publication of the notice) within which and the manner in which any objections to the draft may be made to the Minister, and the Minister shall consider any objections made within the time and in the manner specified in the notice:

Provided that the Minister shall not be required to consider any objection unless it comprises, or there is submitted therewith, a statement in writing setting out the specific grounds of the objection and particulars of any omission, addition or modification asked for, or any objection which in his opinon is frivolous.

3. (1) If there are no objections which the Minister is required to consider, or if all such objections are withdrawn, the Minister may make the order either in the terms of the draft or subject to such modifications, if any, as he thinks fit, being modifications which in his opinion do not effect important alterations in the character of the draft as published.

(2) Where any such objections as aforesaid are made and are not withdrawn the Minister shall cause a person appointed by him for the purpose as being an impartial person to make such enquiries (including so far as the said person considers necessary, the hearing of oral evidence) as the said person considers necessary, and the Minister may after considering the report of the said person make the order either in the terms of the draft or subject to such modifications as the Minister thinks fit.

4. Where—

(a) the Minister has prepared a scheme under sub-section (3) of section two of this Act, or

(b) at any time before the first day of July, nineteen hundred and forty-seven, he has prepared a scheme under sub-section (2) thereof for a port at which immediately before the passing of this Act arrangements were in operation as mentioned in the said sub-section (3), and it appears to him expedient that this paragraph shall have effect on the grounds mentioned in that sub-section,

he may certify that on account of urgency the scheme should take effect immediately, and if he so certifies he may make an order embodying the scheme without complying with the foregoing provisions of this Schedule:

Provided that a scheme embodied in an order made by virtue of this paragraph shall not continue in force after the expiration of six months from the making of the order.

5. *The Minister may with the consent of the Treasury pay to persons appointed to make enquiries for the purposes of this Schedule such fees and allowances, and to persons giving evidence thereat such allowances, as he may with the consent of the Treasury determine.*

Retirement of Falmouth Docks Manager

On September 30th, Captain H. W. Bartlett retired after 23 years' service as manager of the Falmouth Docks and Engineering Company, of which he has been director for a number of years. During the period he was with the company, very considerable alterations were made to the docks, including the construction of two large graving docks and the extension and widening of a third, also the building of four new jetties, largely constructed of Empire timbers. An oil-bunkering wharf was completed, an oil-storage tankage depot installed, and 10-in. pipe lines laid for receiving and distributing centres in the locality. Considerable dredging schemes were also carried out, dock buildings erected, railway sidings put in, and the docks generally extended.

Captain Bartlett has held many public offices. He was at one time deputy-mayor of the borough, he is chairman of the Falmouth Harbour Commissioners, member of the Sub-Commissioners of Pilotage, chairman of the Port Registration Committee and was, until his retirement, the Ministry of War Transport's representative in the port, and chairman of the Port Emergency Committee.

To render a full service covering the Midlands, Butters Bros. have opened a new Crane Depot in Birmingham. Here they announce a wide range of cranes available for hire, and state that the storage, servicing and repair of customers' own material can be undertaken. Enquiries should be made to Butters, Bros., Birmingham Office, at County Chambers, Corporation Street.

*The Shipment of Heavy Cargoes**

Novel Methods of Loading at Merseyside

The following article was contributed to *The Journal of Commerce and Shipping Telegraph* by a special correspondent.

At this time, when it is more important than ever that efficiency should govern all our shipping undertakings, it is reassuring to find that one of the oldest trades in this country, that of stevedoring, has its new men who are determined that a scientific approach shall replace the old formula of brute force in stowing ships' cargoes.

A recent visit to the Birkenhead docks to see the loading of one of Britain's new heavy-lift ships was productive of information about this change of attitude. From time immemorial, the traditional way has been to squeeze and force cargo into ships' holds. For centuries the shape and size of cargo holds followed a common stereotyped plan, and mainly because of that the loading and discharging of cargoes saw little that was new or novel in its application. To-day, it is true, there is little change in the physical structure of that part of the ship which houses the cargo, save for one or two notable exceptions; but there is a change in the methods by which the more advanced stevedores are carrying out the loading.

Scientific Approach to Problem

With particular reference to shipping heavy lifts, this scientific approach, developed throughout the war years, has been eminently successful. Formerly, in this country the occasional shipping of heavy lifts was almost a case of trial and error with scores of labourers standing by to supply the necessary handling power when and where required. To-day, similar lifts are handled confidently and expeditiously, with a minimum of fuss, with a greater measure of security and with far less reliance on man-power.

The loading and discharging of heavy weights aboard ships must of a necessity be a highly specialised task, for with each working part operating at somewhere near its maximum strain, the addition of the slightest risk might entail disaster. In the past, accidents have happened that could have been avoided if the operation had been studied from a scientific angle.

In lifting water-borne craft the correct placing of slings must always be a difficult decision. The only sure way in which they can be properly placed is by carefully measuring up and assessing the weight of each compartment contained in the total lift. Then, by means of a formula, the centre of balance can be determined and the safe lifting of the weight assured.

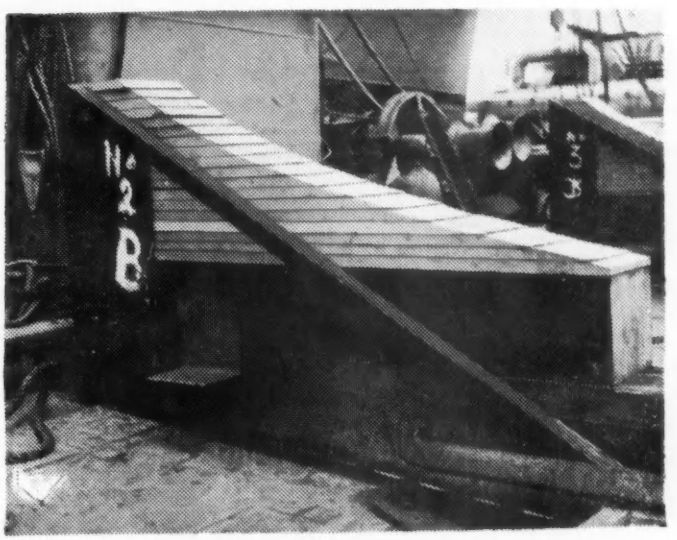
If, by some chance, the lift shows signs of not coming up properly balanced, the weights are checked through again and invariably it is found that the error has crept in through one of the compartments containing previously unsighted water or similar weight in its area. Similar formulae guarantee the safety of the lifting gear, and it is by the careful attention to each minute detail that success and speed are assured.

This type of stevedoring, calling for heavy-lift experts, is a relatively new departure for this country, and one which was greatly developed during the war. Before the war, most of this work was handled by Norwegian ships, specially designed and built for the purpose. The war, however, compelled us to tackle it on a large scale ourselves. The tasks of landing huge properly equipped armies, first in North Africa and then in France, called for the expeditious handling of heavy cargoes such as were rarely known in peace-time. Not only had all types and designs of heavy lifts to be loaded into ships, but arrangements had also to be made for their discharge in places where there were inadequate port facilities. There were no experts in this country to say how it should be done, and in the end enterprising stevedores solved it by the drawing board and by calculations.

To that extent the war has brought an improvement in our shipping services; it has made possible the trans-shipment overseas, quickly, of sea-craft and land vehicles of a size and weight hitherto unknown. Some idea of the varied nature of this work can be seen from the war records of this port.

The entries include the lifting and handling of over 150 200-ton U.S. Army tugs, the shipping of long unwieldy 120-ft. submarine chasers and high-speed launches, coasters, 100-ton lighters, and a host of other types of water-borne craft of complex design.

Many shipments were similar in construction and standard loading chocks and equipment could be prepared for them, but a great many more were of varying shapes requiring scientific methods to ship them quickly and safely aboard, and so arranged that the ships' personnel could discharge them equally as easily. No ship or convoy was ever delayed by the difficulties imposed by the loading of these heavy consignments, and the speed and efficiency with which it was all accomplished was due to intelligent anticipation of the problems involved.



Cargo Cradle on Deck of Heavy-Lift Ship

The early application of the drawing board and a theoretical approach to the problems of loading soon evolved a facile solution, which rapidly developed into expertness. The Americans sent over a heavy-lift expert to advise this country on the reloading of the many heavy weights which their ships were bringing over. When our methods were explained to him, he admitted that the British conception of tackling heavy lifts was years ahead of the times.

In the stowage of heavy tugs, coasters and lighters on board ocean-going ships, America still used hundreds of men to manhandle the lifts into position and, while the weight of the lift was still suspended, carpenters and labourers hastily built the cradles and beds in which they were to be stowed. On the other hand, the practice of Messrs. Smith in this country is to have the beds and cradles fitted in the holds and on the deck as soon as ever the ship berths.

In fact, as soon as information is received of the proposed cargo of heavy lifts to be loaded, the cradles are built or laminated before the ship arrives. The iron work for securing the cradles in position, and to the deck, is pre-fabricated. The wood-work forming these cradles is made up of a series of movable wedges which take up their proper position as soon as ever the weight is supported.

Then liquid asphalt is poured down a special cavity that runs between the upright iron channel bars and the end of the wedges, and the whole cradle is thus rendered one solid block, accurately shaped to fit the curve of the weight it supports.

In these specially designed heavy-lift ships, the idea underlying their loading is to make the cargo one immovable block, and here welding plays a big part. One cargo loaded in the Empire Viceroy comprised 20 coasting vessels, tugs and similar bulky craft; each one of these had welded angle irons securing it to the ship's deck as well as other angle irons welding each vessel to its

*Reprint, by permission, of article on the Stowing of Cargoes, in the "Journal of Commerce," of September 6th, 1945.

Shipment of Heavy Cargoes—continued

neighbour. In addition, there was the lashing power supplied by 9,500 fathoms of 2-in. wire and the resilient chocking effect of some 300 tons of soft wood in the shape of laminated cradles and wooden supporting ways.

Use of Scale Models

It was the cargo holds, however, that presented the most difficult part of the storage operation. Each of the three holds contained three vessels and the handling of this number below decks in a very confined space necessitated accurate plotting, first on the drawing board and then with actual scale models, before the real job was tackled. It was a job in which inches counted, and the tightness of the fit can be imagined from the fact that some of the vessels, too long to be shipped straight through the cargo hatch, had to be swung diagonally across the hatch in order to get them through the deck opening.

ELEVATION (PORT SIDE)

HOLD PLAN

DECK PLAN

Cargo Stowage Plan

The shape of the forward hold presented another difficulty, for the inward sheer of the hull meant that the bottom of the hold had to be built up with cargo to present a platform which would allow the three vessels to be stowed on the same level.

The first vessel was lowered down on to the centre of the hold, landed on cradles and then fleeted out to the side of the ship by tackles. The second was lowered down and fleeted out to the other side and the third, with only an inch or so to spare, took up its position in the centre of the hold.

When the holds were full the hatches were battened down and the deck prepared to receive 11 similar ships. The only way in which that number could be accommodated was by placing them athwartships, and, to provide the necessary room, two samson posts and electric winches serving them had to be moved forward to allow sufficient clearance. Then, when the decks were free of obstruction, two iron channel bars were fitted in position longitudinally along the hatch tops and the laminated cradles for the first vessel housed in them. Then as each lift was lowered into its cradle it was fleeted along the angle ways, liberally greased with soft soap, and in this way the 11 little ships were stowed above decks, and a total weight of over 1,000 tons was distributed on the hatch tops and gunwale rails.

It is both novel and impressive to witness the expediency and smoothness with which these heavy consignments are shipped. Everything is prepared beforehand and when the time comes there is no hasty sending away for a bigger shackle or a larger sling or any other last-minute adjustment. Every ship that takes a heavy lift is accurately measured up and a detailed plan drawn; afterwards the plan is filed away for future reference should the ship be again called upon to load other heavy weights.

Altogether the Government plans to have six of these special heavy-lift ships in service and authorities already speak of having sufficient reconstruction work on hand to keep them fully employed for the next five years plying between Europe and the Far East.

It is not only in heavy lifts that this new type of stevedoring is becoming apparent. It is in the service provided by better and more detailed cargo plans that the new approach is seen. It can be seen also in the mechanical handling of goods on the wharves and in the warehouses. Efficient modern tackle, the use of electric trucks and cranes, all with their own flood lighting, indicate the extent to which new ideas have come to invade the age-old business of loading ships' cargoes.

This account is only of one instance of what stevedores are doing to increase the efficiency of their trade; doubtless it can be repeated elsewhere, but from this citation it will be seen that they are prepared and ready to help the British shipping industry in the tremendous post-war effort that awaits it.

Correspondence

Geodetic and Tidal Levels

To the Editor of "The Dock and Harbour Authority."

Dear Sir,—

In your July issue you published Mr. Hall's comments on an article I sent you on Geodetic and Tidal Levels. I value the opportunity to supply some remarks on these academic and hydrographic points. Naval resettlement duties have given me no time since then for such matters. Mr. Hall considers that T.H.W. "as it is now used, was not planned or designed, but was rather quite fortuitous and haphazard in its origin." I quote his words. He may be entitled to his opinion. I am sure he will accord the same facilities to your signatory. Apart from being a Younger Brother of the Trinity Corporation with opportunity for studying the precision of their work which, like T.H.W. is statutory, I would remind you, Mr. Editor, that there lived in these times some of the finest engineers this country has produced and all associated with London River:

Rennie, 1761-1821.	London Dock and E. India Docks.	Telford 1787-1834.	St. Katharine Docks
Brunel 1825-1843.	Thames Tunnel at Wapping.		

Is it suggested that these gentlemen were not avid for precision in their work, seeking a standard which would afford common ground and agreement for tidal level and tidal range? I cannot see them building to a line which was quite haphazard and/or fortuitous.

Concerning my diagrammatic explanations of the Thames Flood levels, I may disabuse Mr. Hall of his assumption that I am endeavouring to set up new values for T.H.W. or perpetuate its imperfections.

As a horizontal zero for the measurements of the Thames Floods from Southend to Teddington, it was recommended by the late Sir Frederick Palmer and Sir George Humphreys: what was good enough for these eminent engineers will be good enough for your signatory in this field of endeavour. Waviness in Mr. Hall's terminology indicates that he is looking at the drawing board more than at the facts.

Finally, in paragraph 6 of his letter, No. 2 statement, Mr. Hall remarks that "London zero tide is a low water datum 10-ft. below O.D. Newlyn—for places lying between London Bridge and Shornmead Light at the Lower Hope."

This does not square with the facts that the zero of soundings is used by the Tidal Institute and the Admiralty for the zero of predictions, in the build-up for the Tide Tables. At the express request of the Institute the nexus and zero of predictions was moved to Southend where a fairly free wave is obtained for the Harmonic Analysis. Upstream and where the river narrows suddenly—as at Shornmead and at London Bridge—the accuracy is affected by non-harmonic constituents.

Yours faithfully,

ERNEST SHANKLAND, Capt. R.N.R.

14th October, 1945.

The National Dock Labour Corporation

*Some Thoughts on the Future**

By Rt. Hon. ERNEST BEVIN, LL.D., M.P.

I am in some difficulty in talking about your future; but one thing I would note—as I have done previously—remember that within a year you will have an entirely different personnel to deal with.

As I understand the situation at the Docks, the average age is very high; the men that you have been working with throughout the war will, in the process of time, pass out; it is inevitable; and you are going to get back large numbers of men who have been subjected to an entirely different type of life during the war. I do not think it is right for any industry to judge its position on the basis of the war, or pre-war days, as to the kind of personnel they are going to have to handle after the war. We made that great mistake in 1918, and I can only remind you of the unfortunate mistake in handling the men who came back from the Army on that occasion, of the lack of preparation to meet the situation which inevitably arose, and gave us eight years of the most terrible industrial trouble this country ever saw.

I say to both sides of the industry that if you approach this problem with the same kind of outlook and the same kind of mind that we looked at everything before the war, or even during the war, you may land this country into another frightful mess. Whatever one's political views may be, I am sure that the essential thing, in order that this country may recover, is a period of ten years of industrial stability and then it will go on much longer.

There will be frightful troubles in Europe before this business is settled. When you have taken nearly eleven million people out of a population like the United States and the huge population out of our Dominions, as well as in Europe, it is not going to be an easy thing to resettle people back in their normal life. I say to the Union Officials, if you approach the problem with the mental outlook of the men who have been here all the time, you will have grave disillusion. If the employers take the old-fashioned attitude, I think they will be in great difficulty, too.

Now, there is one thing that will be fatal to this country and that is long and protracted strikes. The loss of production from 1918 to 1939, speaking from memory, I think was about three hundred million man days of production and nearly all of it was due to short-term approach to the problems that had to be faced. I analysed these figures when I had to supply this information in the House of Commons on Full Employment and I must say that I was staggered myself. The employers fought the Unions to get wages down and the Unions fought to get them back. Each time, up and down in the different industries, the struggle went on, and after 20 years all we had done was to change the wage rate up four points; and to do that we had lost three hundred million man days production. The wealth that was lost in that fighting would have put the standard of living up about 15 points in this country. I do not think, Mr. Chairman, I can put it simpler than that.

In the process of the struggles and the lock-outs and the fights we lost an enormous amount of our overseas markets, which we never recovered. We failed, I think, very largely to recreate the entrepôt trade with Europe which was broken by the last war. This trade we never got back, and we brought into play new productive powers in competition with ourselves that would never have arisen in the normal way. Industrialisation will go on, but these great disturbances make it difficult to adjust the requirements of the world in a way that is reasonable and normal. All I am pleading now is for the nation to take a sane measure of the problem and to try and take a long-term view.

Now, with regard to the Corporation itself. I have heard of your difficulties. I guessed that there would be opposition on the part of some of the men. You cannot easily change habits of men that have been formed for over one hundred years. It is only by a new generation, who are growing up in a new environment, that these things can be accepted. But this I will prophesy—that unless the industrial machine can be so adjusted as to give far greater security to the men than they have had before, then the troubles which I have indicated, in my view, are bound to arise.

They arise in a curious way. When men come home one week with nothing and then next week with big pay, and then nothing again, the whole life of the home becomes disturbed and leads to domestic difficulties—the people cannot budget their lives with any sense of security and rule. I have had 35 years of this Trade Union experience and I know that as a rule, the thing that the dispute takes place about, has nothing to do with the real cause underlying the trouble. And the thing upon which you fight, as I say, has no real bearing at all on the real problem underneath.

It is very significant. I have been round the country electioneering and I have met lots of the men and, although the Corporation gets grouses, the good men are wondering whether this is going to go on. The quicker this question is settled on a permanent basis in some form or other, the greater measure of stability you will create in the industry; as the other men come back to the industry, they will come back and accept it; and it will then become the normal standard and the new discipline will be accepted automatically as a normal development.

Now, you will have a considerable number of men returning from the Services. There are quite a good number from this industry. But you will also have to recruit the rising generation, obviously. I would like to put this point to you. The Education Act will come in in 1947 at the latest. That raises the school-leaving age to 15, and part-time education will go on to 18. Further, as I have already said publicly, until we are out of the wood there will have to be another Military Training Act; and that will mean that after the lads are admitted to industry, they will go for military training and return later to the industry. This you cannot leave to a casual system. I am quite certain that it will not fit in with the State requirements and some organisation of some kind—if this is not the right one, something superior—will have to be devised not only in this industry but in other casual industries as well because, from the very nature of our defence and our security, order has got to come into industries of this character.

Now, may I say something about defence in shipbuilding, dock working and on the sea. It is not realised, I think, how the neglect of these industries, or the failure to have a correct policy in dealing with them, brought up perilously near to disaster when the war broke out. In the shipbuilding industry we had dropped from about 320,000 men in 1922 to 96,000 men in 1938. Everyone in the shipping business knows that, as ancillary to its peace-time purposes, there must be in an island such as this, at least a minimum of 18,000,000 tons of shipping available if you are to feed the country in time of war. It is our sincere hope that there will be no war again. That is what we hoped last time, but I think it is imperative that the nation should keep its powder dry this time. It ought to shape its commercial policy so that while serving the public all the time and meeting the commercial requirements of the country, it ought to be of such a character that it has a ready means of defence always at its disposal. This, in my opinion, is essential and, therefore, in the building and shaping of our own and naval requirements this aspect of defence should be remembered and ordered so that we may retain a standing army, as it were, of shipbuilding and the necessary workers of about 250,000 men as a minimum in peace time. This would be a great insurance for our defence.

As for the dock industry, I do not know what is required, as no one can tell what the trade of the world is going to be, but Dock Labour Schemes were established under the most desperate circumstances in which we knew from the Intelligence Reports that Hitler was going to attack Glasgow and Merseyside and they were our last two mouths open to feed effectively the country. So that the problem I had to consider very quickly was this. How could I hold the men? I could not put them into khaki. This Scheme was the plan which gave the men a vested interest in their industry. As a matter of fact, in Liverpool and Manchester I do not think we lost a man in the eight days of terrific bombing.

*Slightly abridged from pamphlet issued by the National Dock Labour Corporation, Ltd.

National Dock Labour Corporation—continued

One last point. Before this war broke out a few of us sat down to find out how we could put the dock workers of this country into a pool to move from East ports to West ports. There was not very much to guide us and in the end we succeeded. But it cannot be left in the future to act in such a " scratch " method, and therefore I make an appeal against parochialism.

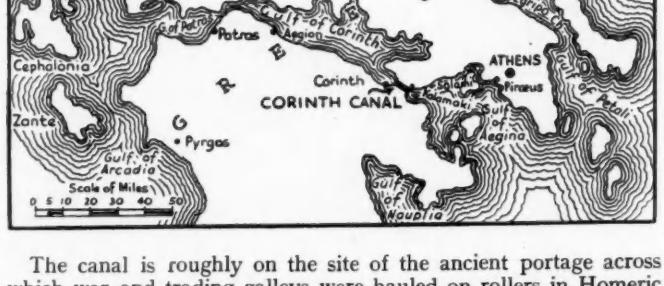
The great thing we have to face is the new weapons which are almost in the stage that the aeroplane was at the end of the last war. We are now a frontier country as never before and our dock work, upon which our shipping and our life depend, is most vital. We ought in peace time to work out a scheme, which while maintaining a good deal of local autonomy, would accustom the men to regard themselves as a part of a national industry, so that if trouble ever came, you could move and organise your people quickly in order to cope with these problems and not to improvise as we have had to do.

I belive that most of us do look upon this problem with prejudice and rather old-fashioned ideas about our own particular business or wharf. I would ask both sides of the industry to remember that this is a vital national service which must contribute to our commercial success and to the security of this country. In shaping the policy, so arrange your affairs that this old country can have your aid in time of difficulty and at the same time you can contribute so much to her economic success.

The Corinth Canal

An Important Grecian Waterway

During the occupation of Germany the Corinth Canal was very seriously damaged and blocked to traffic; plans are now in hand to reconstruct it on an improved scale and both the United Kingdom and the United States are interested. One of the dullest canals in the world to traverse, running four miles in a dead straight line between cliffs ranging up to nearly 300-ft. in height, shutting in all view for the whole length, historically it is one of the most interesting and is of great economic importance although that will be increased if the present plans come to fruition.



The canal is roughly on the site of the ancient portage across which war and trading galleys were hauled on rollers in Homeric days, saving nearly 200 sea miles of very dangerous coast round the Peloponnesus from the Adriatic colonies and trading associates to Athens. Periander of Corinth planned a canal about 600 B.C. and Demetrius of Macedon did the same 300 years later. The Emperor Nero started work in 67 A.D. along the exact line of the present waterway and 6,000 Jewish prisoners were employed. The fact that, during the few months which the effort was maintained, they are believed to have excavated 650,000,000 cubic yards suggests that modern Germans had nothing to learn from Ancient Romans in the matter of forcing labour.

The canal was one of the first plans of development put forward when Greece became independent of Turkey, but no money was available and it was not until 1881 that the route was re-surveyed. In the following year construction was started by a French company which gave up in 1889 and handed the job of completion to Greeks. In November, 1893, it was opened and was acknowledged by engineers to be a very fine piece of work.

Its length is just under 4 miles, the two ends being protected by breakwaters with lighthouses; the width at the bottom is approximately 75-ft. and the depth of water 26-ft. The slope of the sides is about 10 in 1, but from time to time the waterway has been blocked by landslides, the last big ones before the war being in 1917 and 1924. Apart from the possibility of these slides the greatest handicap to the use of the canal is the current running from 1 to 3 knots. A maximum speed of 6 knots is laid down and the bigger ships often have the services of tugs for safety. Merchant ships up to about 3,500 tons gross can use the canal with perfect safety and warships up to about 4,500 tons displacement.

Considering the nature of the terrain there should be no difficulty in increasing the standards very considerably, quite sufficiently to accommodate the biggest ships likely to use the route for a good many years to come, and the British and American Governments would appear to be willing to help the Greeks in that, provided they have guarantees that there will be no victimisation of foreign flag shipping in the matter of dues and regulations.

FRANK C. BOWEN.

A Notable Floating Crane

One of the Most Powerful in the World

In the naval technical section of the Spanish journal *Brujula* for June 15th last is a description of a floating crane of 350 tons lifting capacity, which is stated to have been constructed in France at the beginning of the war. It is equipped with twin hooks, on an articulated jib and is one of the most powerful floating cranes in the world, if not the most powerful.

The following is a statement of the lifting power at various outreaches:—

350 tons at 18 metres from main support; 300 tons at 20 metres; 260 tons at 25 metres; 200 tons at 35 metres; 100 tons at 42 metres; and 50 tons at 48 metres from main support.

Speed of movement is given as 2.40 metres per minute for the maximum load in first gear; 4 metres per minute for 170-ton loads in second gear and 8 metres per minute for 65-ton loads in second gear.

In rotation, the speed is 1 revolution in 10 minutes.

The pontoon has a length between perpendiculars of 62.5 metres, a beam of 38 metres and a mean draught of 3.10 metres.

Propulsion is by Diesel engines at 5.8 knots.

It may be added that the world's largest floating cranes include one of 300-tons lifting capacity at the Port of New York; two of 250-tons lifting capacity at the Port of Balboa (Panama Canal); and one of 200-tons lifting capacity at the Port of Liverpool.

Dock Manager Honoured

A dinner was held at Bristol, on October 6th, under the chairmanship of Alderman A. W. S. Burgess, chairman of the Port of Bristol Authority, in honour of Mr. R. H. Jones, who has just retired from the general managership of the docks undertaking. The function was arranged jointly by the Port Authority and the Port of Bristol Employers' Association. Mr. Jones was presented with a cheque by Mr. Chas. L. Hill, vice-chairman, on behalf of the Association. At an earlier gathering of dock officials, Mr. Jones was the recipient of a silver rose bowl, as an expression of their respect and good wishes.

The Second Report (for September, 1945) on the **Transport Situation in Europe,** issued by the Provisional Organisation for European Inland Transport, of Berkeley Square House, London, W.1, contains further useful data in regard to the resuscitation of transport agencies on the Continent of Europe. Railways, Road Transport, Inland Waterways and Ports are briefly reviewed for each country in turn, and at the end of the booklet of 28 pages, there is a set of maps and graphs explanatory of the statistics in the text. Summarising the facts in the Introductory Note, the Report states that the data received from various sources show clearly that at the end of August, the transport situation in Western Countries was beginning to straighten itself out in most areas. The price of the compilation is 5s. net.

*Two New Quays at Tyne Dock, South Shields**

By ALFRED LAIRD HARVEY, M.C., B.A., M.Inst.C.E.

Discussion

(Continued from page 142)

The **Author** introduced the Paper with the aid of a series of lantern-slides.

Mr. W. P. Shepherd-Barron said he thought it was very creditable to carry out in war time the sort of work that had been described by the Author, and he was sure many of the members had felt envious when they saw the amount of timber that had been used in the work in question.

The North-West quay was 800 feet long and 51 feet wide, and the Author had stated that there were no expansion joints at all. He would like to know whether there had been any excessive cracking or any trouble of that sort. The Port of London Authority had constructed three works of very much the same type as that described by the Author, being of cylinder design. One quay was about 5,700 feet long and 19 feet wide; expansion joints were put in at intervals of 480 feet and there was no cracking. The second quay was about 1,700 feet long and 45 feet wide; no expansion joints were used, and there was distinct cracking on the deck and some of the beams. The most recent quay was about 3,500 feet long and about 45 feet wide, and expansion joints were put in at about every 340 feet. There was a complete joint through the structure and also a sliding joint in the crane rails and quay rails; no cracking had been found, but in a capping beam running along the shore side of the decking, which tied together the foundation columns of the adjoining transit sheds, a crack was found opposite each expansion joint. No cracks appeared in the quay structure. It was found in the summer that the expansion joints were obviously working, because the bituminous solution had squeezed up out of the joints. It seemed to him that it was rather risky to put in an 800-foot decking without an expansion joint, and he would be interested to hear whether it had been quite satisfactory.

With regard to the question of grabbing cranes, he noticed that 3-ton electric quay cranes of the ordinary type were fitted with grabs for the discharge of iron ore, and he would be interested to know the weight of the grabs. In grabbing work for the discharge of cargo it was generally found that nothing much less than a 6-ton grab was suitable; otherwise one might pick away at the stuff in spoonfuls. Assuming from 15 cubic feet to 17 cubic feet per ton as the weight of ore and allowing for the snatch of grabbing, a rather severe load would be imposed on a 3-ton electric quay crane if a really good output was to be obtained. He would therefore like to know what the Author's experience had been with regard to the actual output with a grab of the size in question. He found that in the case of the modern crane for grabbing work, averaging from 7½ tons to 10 tons, the hoisting speed had been increased to 250 per minute, whereas the cranes referred to in the Paper had the normal hoisting speed of 200 feet per minute.

Mr. E. J. Buckton observed that his first introduction to the Tyne had taken place in the days of the late Sir Frederick Palmer, when schemes were being drawn up for the development of Jarrow Slake, where there were timber ponds and a very difficult foundation. Just before the war the Commissioners decided to build a permanent quay where the Sutherland quay now stood; when the war started, the work had reached tender stage, but of course it was stopped. About the year 1940 there was an emergency call for a riverside jetty, to be completed in nine months. His firm were consulted and they said it would not be possible for the kind of wharf that was wanted, to take ships bringing ore from America, to be built in nine months, but that it might be done in fifteen months. As they did not want to see such a fine site cluttered up with a lot of emergency war works, they drew up a scheme with Mr. Hindmarsh. There were two strong points which would act as dolphins, and those were to be in the permanent work. The temporary work was to be a timber bridge which could be pulled out at the end of the war. In war time, however, people were not concerned with the future; they concentrated their attention on the present-day demands; so the scheme was abandoned, and the timber structure was put in which the Author had shown in the slides.

He was interested in a comparison of the three types of wharf: the one which had been designed by Mr. Hindmarsh and his own firm, but not carried out, the North-West quay and the Sutherland quay.

With regard to the wharf which had been designed but not built, it was a steel cylinder wharf, and the cylinders went from about 4 feet above low water down to rock, which was very deep. There were transverse tapering beams which varied from 6 feet at the shallow part to 15 feet at the deep part. The longitudinal reinforced concrete beams were kept as few as possible, and they were reduced to four. A concrete facing was designed for steel piling, as a protection against corrosion, but later, after long discussion, it was changed to a bituminous coating. There was also a specially strong anchorage, owing to the nature of the site, which was very unfavourable.

For the North-West quay — the permanent structure — the cylinders stopped 48 feet below high water, and from there downwards there were piles. The transverse beams were symmetrical; the longitudinal beams numbered nine, and the steel piling was protected by copper content.

The method of using cylinders and continuing with piles had been adopted in a number of places; for instance, at the Tilbury landing stage. In many circumstances it was quite a good method, but Mr. Buckton preferred cylinders going right down, especially in the case of a river, where there were ships banging much harder than they did in an enclosed dock, and there were much greater depths. The symmetrical beam was quite good enough in still tideless water, but the taper beam was necessary in an open river; if a symmetrical beam were used, there must be some sort of bracing to take the blow which would come on the piles or columns lower down. With regard to the number of reinforced concrete beams, personally he liked as few beams as possible, and he would not have any if it could be avoided. He preferred a solid reinforced slab, as he thought all the beams were a source of weakness from corrosion. He doubted whether the copper content of the steel would be effective.

He would like to ask the Author where he obtained his sand and ballast. When he had been looking into the previous schemes, the sand was to be dredged from Jarrow Slake and the ballast was to come from some place where there was a stock of it, but it was a question of finding suitable filling over quite a big area.

The quay that his firm had designed with Mr. Hindmarsh in 1938 was 1,400 feet long, with a depth of water 50 feet from high water at spring tides, and its estimated cost was about £400 per foot run. The figure of £700,000 given by the Author for the same quay included a good deal of plant for coal loading and ore handling which was not included in the figure of £400. The Sutherland quay was 450 feet long and cost £219,000, which was £480 per foot run. It was built under war conditions, but it was 5 feet less in depth than the quay designed in 1938. It was necessary to write capital off on account of its comparatively short life and the cost of maintenance had also to be dealt with. He thought all that could be said was that it was constructed as a war-time measure and that, as far as the Commissioners were concerned, it was no bargain unless it was well subsidised.

The North-West quay was 800 feet long and cost £190,000, which was £240 per foot run. That was not too bad considering the time when it was built.

Mr. R. D. Gwyther observed that the Author's statement that the skin friction, calculated on three occasions while sinking was in progress, was found to be between 1¼ and 1½ cwt. per square foot, bore out his own experience of sinking cylinders in fine river silt or muddy silt, where he had found on several occasions recently that 1½ cwt. was an almost constant figure.

He was also pleased to find that the Author had kept all the portal beams and cross beams well above lowest working level in the dock. He would not go so far as Mr. Buckton and say he

*Paper read at Maritime Engineering Division Meeting of the Institution of Civil Engineers 13th Feb., 1945. Reproduced by permission.

Two New Quays at Tyne Dock, South Shields—continued

would not have beams at all if they could be avoided, but he knew from experience that reinforced concrete beams underneath the deck gave rise to a great deal of trouble in the way of maintenance. Much depended on the amount of cover that was allowed to the steel reinforcement. He regarded about 1½ to 2 inches as a minimum, and he would like to know how much cover the Author generally allowed on the beams.

The long tie rods entailed a good deal of forged work, and as a rule they proved to be very expensive. He hoped that one day some engineer would devise a scheme whereby tie rods would be replaced by steel flats with a simple connection and but one screw at the end, so that the forged work would be reduced to the minimum.

He would like to know how the fenders and their supports worked in practice. Did they stand up to what was expected of them?

With regard to the costs, taking the first three items in Appendix II, he had found that the 800-foot quay cost about £223 per foot, which seemed to be very reasonable in war-time, whereas the 450-foot quay had cost £302 per linear foot, although a certain amount of timber sheeting and piles had been already provided. From the slides shown by the Author, however, he had realised that the cost of the second quay had been governed by the cost per cubic foot of timber.

Mr. John Palmer observed that it was possible to criticise the design now, but it had not been easy to decide upon that design in the first instance. At the site of the North-West quay, there was 35 feet of water with 65 feet to 95 feet of mud beneath it, on which to build a jetty, and the Author had certainly been confronted with a very difficult problem.

The cost was apparently about £230 per lineal foot of quay, or about £5 per square foot of deck, which he thought was rather high. He would like, however, to look at the matter in another way. When the cost of a building was worked out, some factor was allowed for its depth. In the North-West quay, the depth from the top of the deck to the bottom of the steel cylinders, leaving the piles out of account, was about 50 feet, and he had calculated the all-in cost of the work at about 1s. 9d. per cubic foot, which was not at all bad!

The alignment of the new jetty relative to the old jetty at the site, the Iron Ore quay, was not clear; the Author had stated that one day the North-West quay might be extended southwards. Why had the Author not aligned the quay so that the extension could come in front of the existing old quay? Why had he carefully brought the new quay in at the back of the old quay? Probably there was a good reason, but it had not been explained in the Paper.

Mr. Palmer would like to have more details about the fenders. What assumption had been made for the weight of a vessel striking the pier, and what velocity had been assumed? When energy absorption figures were worked out, it was usually very difficult to prove that the energy was absorbed unless a velocity of a fraction of one foot per second was assumed, and then the V^2 factor was a help.

The Chairman of the Maritime Division had stated that those who were engaged in this branch of engineering had the most interesting work of all civil engineers, and it followed that they also had the most difficult work. Inevitably, therefore, they would occasionally make mistakes, their works would go wrong, and things would happen in unexpected ways. Members of the Maritime Engineering Division should therefore pledge themselves to follow the Author's good example, and when their sheet-piling moved in a way they had not expected it to do, they should tell each other frankly. They had the most difficult problems to solve, and their troubles should therefore be freely discussed at the meetings of this Division.

Mr. W. H. Ward observed that in referring to the driving of piles within the cylinders, the Author had stated that the piles had an unexplained tendency to drift inwards during driving, but he had also stated, in connection with the sinking of the trial cylinder, that the bottom silt rose about 9 feet 6 inches while the piles were being driven. In other words, the surrounding silt was tending to flow upwards towards the inside of the cylinder and there would consequently be a tendency for the piles to drift inwards. Probably the silt suffered a reduction in strength during driving and that reduction would be most marked within the pile ring. Hence there would be a greater tendency for the silt to flow upwards from within the pile ring than from outside through the pile ring.

He wished to ask why the tie-rods in the North-West quay were tightened up to the limit of the bearing capacity of the anchorages before dredging. He considered it was desirable to see that the tie-rods were all tightened up reasonably uniformly before dredging or filling, but he could see no advantage in stressing to the limit. If it were assumed that the anchorages had a factor of safety of 2 against ultimate failure, then, if the Author's procedure was followed, the top of the sheeting might move *in* a distance x after dredging, owing to reduction in stress in the tie-rods, whereas, if the tie-rods were only nominally stressed to, say, 5 tons in each, the top of the sheeting might move *out* about $\frac{1}{2}x$. It appeared, in fact, preferable to pre-stress the tie-rods to their final value before dredging was commenced. That should reduce the movement of the top of the sheeting to the minimum. However, at present, it was not possible to assess the final tie-rod pull with accuracy and Mr. Ward would emphasise the need for measuring its value whenever the opportunity occurred.

Mr. Savile Packshaw observed that the design adopted for the North-West quay provided a very good and clean-cut solution to the problem of constructing a deep-water berth in very poor soil. The quay really consisted of two entirely separate structures. The decking on its cylinders and the piled foundation were called upon to carry essentially vertical loads, due to the crane, the railway, and so on, with the exception of the relatively small forces due to the impact of ships. The sheet-pile retaining wall had to deal with nothing but horizontal earth pressures and earth resistances. That division of the quay into two structures materially simplified the design of each.

The ground testing plant used for exploring the subsoil provided what was in effect a miniature test-pile and had obvious advantages in lightness and cheapness in comparison with full-size test-piles. It was very useful when employed in conjunction with borings or when the general characteristics of the ground were known and when its main purpose was merely to forecast the length and behaviour of the piles which would derive their bearing capacity from hard strata, such as hard clay or compact gravel. There were, however, definite limitations to the usefulness of the plant, or, indeed, of any kind of test-pile, especially when the conditions which he had just mentioned were not applicable. The value of the pile formula was then also in doubt. For instance, if the pile was driven into silt or soft clay without reaching any firm stratum, so that it derived its bearing capacity mainly from surface friction, the characteristics of the soil might alter considerably after the pile had been driven. Such a tendency could very often be discovered by re-driving the test-pile some hours, or even days, after completion of the original driving. In fine silts the re-adjustment of the soil was probably complete in a few hours, and it was probable that the resistance of the pile would increase. In soft or medium clays the adjustment might take much longer, and the resistance might increase or decrease. During the passage of the pile through the soil there was a certain lubricating or re-moulding effect which temporarily reduced the surface friction. On the other hand, the soil under the point of the pile was compressed, and until the water had had time to disperse into the surrounding soil the load from the pile was carried partly by the solid structure of the soil and partly by the water. Ultimately the water dispersed, and then the whole of the load was thrown on to the solid structure of the soil, which might or might not be strong enough to carry it.

A case in point had occurred in 1944, when some piles were driven into soft clay to a calculated resistance of about 40 tons. When the structure was built the load per pile was only 15 tons, and the settlement was a couple of feet. Doubtless, in that particular case, if a re-driving test had been made, it would have given a fair indication of the alteration in the characteristics of the soil. He concluded that in such circumstances the bearing value of the pile should be determined from a test load and not from a test-pile and a pile formula.

There were other limitations to the reliability of test-piles. For

Two New Quays at Tyne Dock, South Shields—continued

instance, in some circumstances the carrying capacity of a single pile might be smaller than that of individual piles in a group, or piles might be driven down to a firm stratum of the ground which had soft material underneath it.

The Author had suggested that forward movement of the sheet-piling was due to the excessive weight of the filling deposited behind it, but it could be ascribed more particularly to the fact that where the movement occurred the ground-level in front of the sheeting was low and consequently the penetration of the piling was not sufficient to develop the necessary horizontal earth resistance. In fact, as the filling deposited behind the piling was probably not heavier than the silt and certainly had a very much better angle of friction, the chances were that the pressure on the back of the sheeting was actually smaller where the ground-level was low.

It was a good thing to pre-stress the tie-rods or the soil in front of the anchorage, because he imagined that was done for the purpose of consolidating the ground in front of the anchor wall, so that all the consolidation would be taken up before the full pressure came on to the wall; otherwise the consolidation would be reproduced in the tie-rods and in the wall and would cause an undesirable deflection.

He noticed that the maximum load per tie-rod amounted to only 20 tons when the ultimate resistance of the anchorage was reached. That corresponded to only just over 4 tons per square inch in the tie-rods, and it appeared, therefore, that the anchor wall itself did not reach quite the resistance which was expected of it. Judging from the diagrams, the anchor wall seemed to be rather small in view of the poor quality of the soil.

Mr. Hindmarsh and the Author were to be congratulated on the care they had taken to obtain as much information as possible about the soil and all the other conditions. No doubt that information not only influenced the design but also was very sound economics, because it must have answered many of the questions which the contractors put to themselves when they were tendering and was thus reflected in the tenders which they submitted.

At both the North-West quay and the Sutherland quay the total cost of the exploratory work was about 1 per cent. Mr. Packshaw considered that most clients, and even some engineers, were still inclined to be rather parsimonious in the matter of soil testing, but the work described in the Paper was an undeniable proof of the value of exploring the soil as extensively as possible.

Mr. F. M. G. Du-Plat-Taylor observed that the only two varieties of marine timber borers known in Great Britain were the *teredo navalis* and the *limnoria terebrans*, both of which occurred on the south coast. He would have imagined that the water at South Shields would be too cold for either of them. Neither belonged to the family of the *annelidae*. The *teredo navalis* was a mollusc working entirely under water, and its burrows seldom extended far above low water of spring tides. It was essentially a tropical animal and so far had been found only at such places as Plymouth, Swanage and Dover. The *limnoria terebrans*, which seemed to have been the culprit at South Shields, was a very small crustacean of the isopod variety, about 1/10th inch in length, with seven thoracic segments, which was rather like a very small wood-louse. It worked only between wind and water, as it had to have air at some period of the 24 hours. It burrowed to a depth of about 2 inches, and reduced the timber at that depth to the condition of a sponge. The damaged timber was then washed away by the action of the waves, and the animal started afresh on the surface thus exposed. In the most favourable circumstances, he had found that it could reduce 12-inch by 12-inch timber to 8 inches by 8 inches in 5 or 6 years. It bored into the timber simply to find house room; it did not eat the timber, but lived on minute marine animals.

It would appear that the fender piles provided for the North-West quay might be liable to damage by borers. The Author had mentioned that the old line of timber sheet-piling, 285 feet long, intended for the retention of the ground along the back of the quay, which had been in position for 26 years, was in good condition: but that did not agree with the statement in another part of the Paper that damage by *limnoria* had occurred. Perhaps the Author would state to what he attributed the difference. Even the timber which was incised and creosoted (the incision increased the depth of the creosoting considerably) resisted the attacks of the *limnoria* for only a limited time, and the jetty appeared to be in a rather dangerous state from that point of view: but that would not matter if the jetty was of only a temporary nature, to last for, say, 20 years.

Why were rubber pads selected for the buffers instead of springs? Rubber was not a very good material for a buffer, because it was rather temperamental. In very cold weather it was much less resilient than it was in hot weather, and the tendency of continual pressure on rubber was to compress it and cause a kind of permanent set, so that eventually it became quite hard and ceased to act. The intention might have been to replace the pads as soon as they ceased to function, but a coiled spring of some sort would have been more effective and probably cheaper in the long run.

The minimum radius of 5½ chains for railway curves seemed very small. In some collieries there were lines with a radius of only 3 chains, but those were for only very slow motion and for colliery wagons, which were not liable to severe wear. The minimum radius in the Port of London was 7 chains, and that met all requirements. The radius of 5½ chains was probably due to the limitations of the site, but it was not clear from the plans why it had been adopted.

It was not quite clear whether the cost given for railways in the case of Sutherland quay included the cost of the new exchange sidings or only the railways on the quay. At any rate, the cost of that quay appeared to be very high in comparison with similar pre-war structures. That was probably due to its construction during the war and to the high price of materials, but, if the cost was to be taken as a criterion of the cost of post-war structures, it augured ill for traders embarking on new construction.

(To be continued)

Publications Received

Pictorial Handbook of Military Transportation is a vivid presentation of the work of the United States Army Transportation Corps, published by the Technical Information Office of the Chief of Transportation, Paris. Its 44 pages are crowded with photographs of personalities in the Corps and of the work which was carried out in the theatres of war. They are too numerous for individual notice, but mention may be appropriately be made of pages 27, 28 and 29, in which descriptions are given of the ports of Le Havre, Antwerp and Bremen, where shipping operations of considerable importance were carried on.

Copies of two Papers to be read on November 5th and of a lecture delivered on October 5th have been received from the **Institution of Mechanical Engineers.** The titles are as follows: (1) Elementary Principles of Plant Organisation and Maintenance for Civil Engineering Contractors, by H. O. Parrack; (2) Large-capacity High-pressure Pumping Plant, by F. H. Roberts; and (3) the first James Clayton Lecture on the Early History of the Whittle Jet Propulsion Gas Turbine, by Air-Commodore Frank Whittle, C.B.E.

Under the title of " Henderson Productions," Messrs. John M. Henderson & Co., Ltd., of Aberdeen, have issued an illustrated brochure on **Mechanical Handling and Transporting,** dealing with equipment of various kinds manufactured by the firm, including aerial cableways, cranes of all types, transporters, telpherages, dragline excavators, winches, etc. Copies of the publication are obtainable post free on request to Rooster Publicity, Ltd., Stanground, Peterborough.

Lloyd's Register Shipbuilding Returns for the quarter ended 30th September, 1945, is a partial resumption of the valuable system of shipbuilding returns which prevailed before the war. In consequence of the war, the present returns are limited to vessels being built in Great Britain and Ireland. The tonnage of shipping under construction in Great Britain and Ireland is stated to be 108,950 tons more than that which was in hand at the end of the previous quarter and 326,788 tons more than the tonnage being built twelve months ago.

Canadian Harbours in 1944

Excerpts from the Ninth Annual Report of the National Harbours Board

Shipping

Vessel arrivals in 1944 numbered 38,042, the aggregate net registered tonnage being 27,019,836. In 1943, the comparative figures were 39,041 vessels, aggregating 27,400,898 net registered tons. The following is a comparative statement of arrivals and departures for the last five years:

Vessels—Arrivals and Departures.

	Number of Vessels	Net Registered Tonnage
Arrivals—		
1944	38,042	27,019,836
1943	39,041	27,400,898
1942	43,432	32,680,820
1941	47,333	38,634,005
1940	46,100	36,658,366
Departures—		
1944	37,983	27,079,680
1943	39,177	27,829,502
1942	43,404	33,157,211
1941	47,228	38,685,964
1940	45,940	36,265,889

(Exclusive of naval vessels).

Cargo Tonnage

In 1944, the aggregate volume of water-borne cargo tonnage, inward and outward, was 10 per cent. greater than in the previous year—25,266,024 tons in 1944 as compared with 22,928,404 tons in 1943. The following statements summarise the volume of water-borne cargo tonnage in 1944 and the previous four years:

Cargo Tonnage—Summary.

Basis: Tons—W. (2,000 lbs.) or M. (40 cu. ft.)

	Inward (Tons)	Outward (Tons)	Total (Tons)
Foreign—			
1944	6,349,777	10,261,692	16,611,469
1943	6,411,135	8,763,289	15,174,424
1942	5,740,458	8,115,814	13,856,272
1941	8,789,266	10,307,628	19,096,894
*1940	8,823,136	9,247,489	18,070,625
Domestic—			
1944	5,807,949	2,846,606	8,654,555
1943	5,050,093	2,703,887	7,753,980
1942	5,962,609	2,270,635	8,233,244
1941	7,841,263	2,964,361	10,805,624
*1940	8,443,675	3,534,202	11,977,877
Total—			
1944	12,157,726	13,108,298	25,266,024
1943	11,461,228	11,467,176	22,928,404
1942	11,703,067	10,386,449	22,089,516
1941	16,630,528	13,271,989	29,902,518
*1940	17,266,811	12,781,691	30,048,502

*Includes ballast (non-revenue), bunkers, ships' stores, mail and passengers' baggage; not included in subsequent years.

Revenues and Expenditures

Operating revenues of all units under the administration of the Board were the highest recorded to date, amounting to $12,538,318, as compared with $10,861,081 in 1943. The increase was $1,677,237, or 15 per cent. A substantial increase in the quantity of grain handled resulted in higher revenues from grain elevators, which showed gross earnings over $800,000 higher than in 1943. Increased revenues were also obtained from wharves and piers, cargo handling, cold storage warehouses and bridge tolls.

Expenses of administration, operation and maintenance in 1944 were $5,999,089, as against $5,277,574 in 1943, showing an increase of $721,515, or 14 per cent. Increased expenses were shown under grain elevators, cold storage warehouses and cargo handling—from the operations of which compensating higher revenues were obtained. Expenses of administration were higher by reason of the contribution of the Board to employees' pension fund—the amount paid in 1944 having been $185,904.

Operating income for the year was $6,539,229, as compared with $5,583,507 in 1943, an increase of $955,722, or 17 per cent.

After taking into account debits and credits to income, and charging interest and reserve for replacements, the operations for 1944 resulted in a net income deficit of $3,097,623. The corresponding figure for 1943 was $4,086,204. The net gain over 1943 was, therefore, $988,581, or 24 per cent.

The operations of the Board fall into two divisions: first, the seven harbours administered by local commissioners prior to 1936, and secondly, the grain elevators at Prescott and Port Colborne and the harbour of Churchill, which were entrusted to the Board for operation at the beginning of 1937.

The seven harbours referred to—Halifax, Saint John, Chicoutimi, Quebec, Three Rivers, Montreal and Vancouver—had aggregate operating revenues in 1944 of $11,969,838, as compared with $10,522,624 in 1943. The increase was $1,447,214, or 14 per cent. Expenses of administration, operation and maintenance increased from $4,996,630 in 1943 to $5,662,772 in 1944, the difference being $666,142, or 13 per cent. Operating income rose from $5,525,994 in 1943 to $6,307,066 in 1944.

After taking into account miscellaneous income debits and credits and charging interest and reserve for replacements, a net income deficit of $3,329,084 was shown for these harbours in 1944. The corresponding figure in 1943 was $4,154,261. The improvement was, therefore, $825,177, or 20 per cent.

Capital Expenditures

Capital expenditures during 1944 amounted to $220,665. An additional sum of $13,257, charged to reserves and other funds, was expended on replacement of physical assets, the total outlay being $233,922, as follows:

Capital—		
Halifax		$ 147,021
Saint John		31,885
Montreal		18,767
Vancouver		22,992
		220,665
Replacement of Physical Assets—		
Halifax	$ 7,790	
Saint John	5,000	
Vancouver	467	
		13,257
		$ 233,922

These expenditures were financed as follows: $86,627 by advances from the Dominion Treasury, on which interest at the rate of 3½ pre cent. per annum is charged; $134,038, being for expenditures attributable to the war, by a direct charge to allotments under the War Appropriation Act, without interest; and $13,257, representing the book value of assets replaced, by withdrawals from special funds.

The book value of fixed assets as at December 31st, 1944, was $224,660,685.

The Report, dated June 1st, 1945, is addressed to the Canadian Minister of Transport at Ottawa and is signed by R. K. Smith (Chairman), J. E. St. Laurent (Vice-Chairman), B. J. Roberts and F. W. Riddell.

Proposed Construction of Harbours for Motor Boats

It has been suggested by the chairman of the Marine Committee of the Society of Motor Manufacturers and Traders that the reinforced concrete blocks which are being broken up around the coast of Britain by contractors could be used for the construction of harbours for motor boats and other small craft. Along the United States coastline " marinas " are under construction, where motor boats and small yachts can be docked with safety, and, alongside, stores, fuel and servicing facilities are always available. Most of them are owned by municipalities and all are said to be profitable.